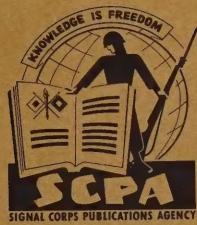


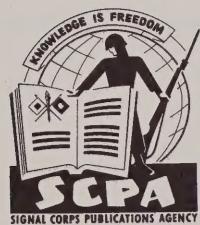
INSTRUCTION BOOK
FOR
RADIO RECEIVING SET AN/FRR-44

F-14



MANUFACTURED BY
MOTOROLA INCORPORATED
ORDER NO. 11661-PHILA-52
20 JULY 1953

**INSTRUCTION BOOK
FOR
RADIO RECEIVING SET AN/FRR-44**



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WARNING

HIGH VOLTAGE

is used in the operation
of this equipment.

DEATH ON CONTACT

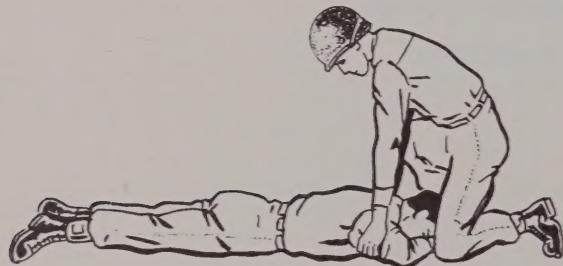
may result if operating personnel fail
to observe safety precautions.



A Position of operator and victim



B Compression phase



C Expansion phase (arm lift)



D Expansion phase (arm release)

ARTIFICIAL RESPIRATION

GENERAL PRINCIPLES

1. Seconds count! Begin at once! Don't take time to move the victim unless you must. Don't loosen clothes, apply stimulants or try to warm the victim. Start resuscitation! Get air in the lungs! You may save a life!
2. Place the victim's body in a prone position, so that any fluids will drain from the respiratory passages. The head should be extended and turned sideward *never flexed forward*; the chin shouldn't sag, since obstruction of the respiratory passages may occur.
3. Remove any froth or debris from the mouth with your fingers. Draw the victim's tongue forward.
4. Begin artificial respiration. Continue it rhythmically and without any interruption until natural breathing starts or the victim is pronounced dead. Try to keep the rhythm smooth. Split-second timing is not absolutely essential.
5. When the victim starts breathing, or when additional help is available loosen the clothing; remove it, if it's wet; keep the victim warm. Shock should receive adequate attention. Don't interrupt the rhythmical artificial technique for these measures. Do them only when you have help or when natural breathing has started.
6. When the victim is breathing, adjust your timing to assist him. Don't fight his efforts to breathe. Synchronize your efforts with his. After resuscitation, keep him lying down until seen by a physician or until recovery seems certain.
7. Don't wait for mechanical resuscitation! If an approved model is available, use it, but, since mechanical resuscitators are only slightly more effective than properly performed "push-pull" manual technique, *never* delay manual resuscitation for it.

BACK-PRESSURE ARM LIFT METHOD

1. *Position of Victim.* Place the victim in the prone (face-down) position. Bend his elbows; place one hand upon the other. Turn his face to one side, placing his cheek upon his hands.
2. *Position of Operator.* Kneel on your left or right knee, at the victim's head, facing him. Your knee

should be at the side of the victim's head close to his forearm, your foot should be near his elbow. Kneel on both knees if you find it more comfortable, with one knee on each side of the head. Place your hands on the flat of the victim's back so that their heels are just below the lower tip of his shoulder blades. With the tip of your thumbs touching spread your fingers downward and outward. (See A)

3. *Compression Phase.* Rock forward until your arms are approximately vertical and allow the weight of the upper part of your body to exert a slow, steady, even, downward pressure upon your hands. This forces air out of the lungs. Keep your elbows straight and press almost directly downward on the back. (See B)

4. *Expansion Phase.* Release the pressure, avoid any finish thrust, and commence to rock backward slowly. Place your arms upon the victim's arms just above the elbows, and draw his arms upward and toward you. Apply just enough lift to feel resistance and tension at the victim's shoulders.

Don't bend your elbows. As you rock backward, the victim's arms will be drawn toward you. (The arm lift expands the chest by pulling on the chest muscles, arching the back and relieving the weight on the chest.) Drop the arms gently to the ground or floor. This completes the cycle. (See C and D). Now, repeat the cycle.

5. *Cycle Timing and Rhythm.* Repeat the cycle 10 to 12 times per minute. Use a steady uniform rate of Press, Release, Lift, Release. Longer counts or about equal length should be given to the "Press" and "Lift" steps of the compression and expansion phases. Make the "Release" periods of minimum duration.

6. *Changing Position or Operator.*

(a) Remember that you can use either or both knees or can shift knees during the procedure, provided you don't break the rhythm. Observe how you rock forward with the back-pressure and backward with the arm-lift. The rocking motion helps to sustain the rhythm and adds to the ease of operation.

(b) If you tire and another person is available, you can "take turns." Be careful not to break the rhythm in changing. Move to one side and let your replacement come in from the other side. Your replacement begins the "Press-Release" after one of the "Lift-Release" phases, as you move away.

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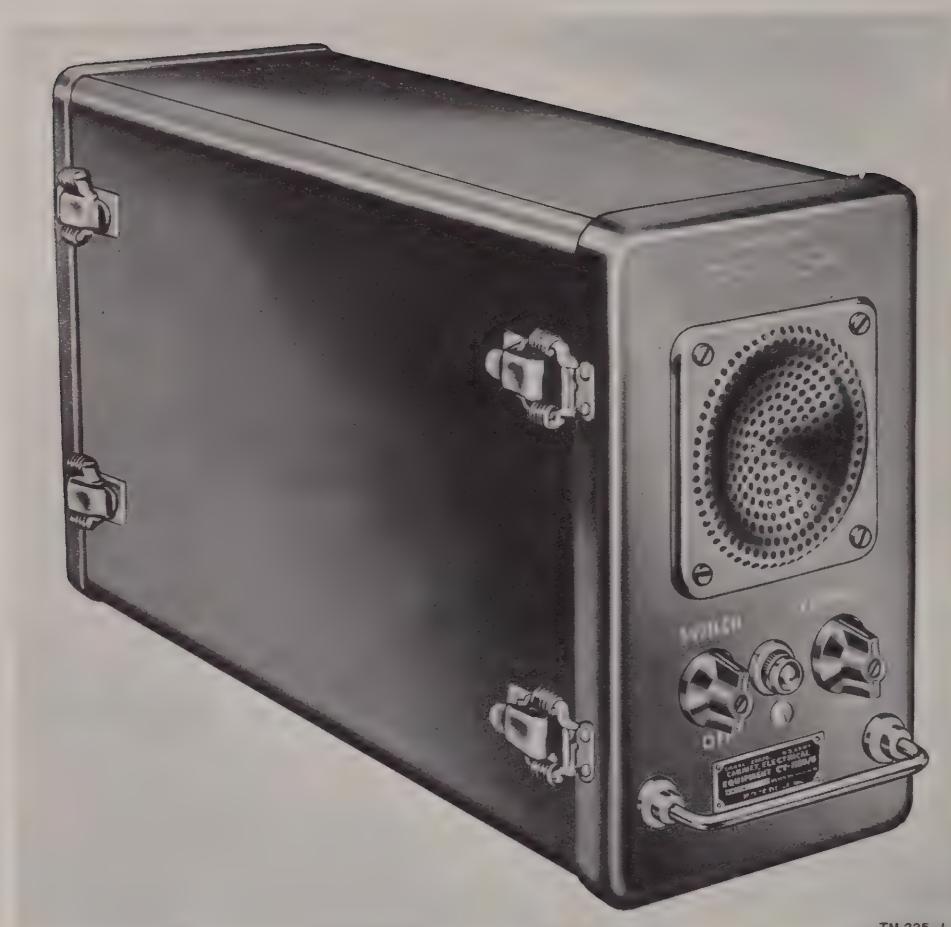
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TM 225-1

Figure 1. Radio Receiving Set AN/FRR-44.

CHAPTER 1

INTRODUCTION

Section I. GENERAL

1. Scope

a. This instruction book provides the necessary information for the installation, operation, maintenance, and repair of Radio Receiving Set AN/FRR-44. In addition to these instructions, there are two appendixes covering a list of references and an identification table of parts.

b. The information in this instruction book is supplemented by the instruction books for Radio Receiver R-257/U and Power Supply PP-846/U. There are frequent references to these books throughout this instruction book.

2. Forms and Records

The following forms will be used for reporting unsatisfactory conditions of Army materiel and equipment.

a. DD Form 6, Report of Damaged or Improper Shipment, will be filled out and forwarded as prescribed in SR 745-45-5 (Army), NAVY SHIPPING GUIDE, Article 1850-4, and AFR 71-4 (Air Force).

b. DA AGO Form 468, Unsatisfactory Equipment Report, will be filled out and forwarded to the Office of the Chief Signal Officer as prescribed in SR 700-45-5.

c. AF Form 54, Unsatisfactory Report, will be filled out and forwarded to Commanding General, Air Materiel Command, Wright-Patterson Air Force Base, Dayton, Ohio, as prescribed in SR 700-45-5 and AFR 65-26.

d. DA AGO Form 11-238 (fig. 20), Operator First Echelon Maintenance Check List for Signal Corps Equipment (Radio Communication, Direction Finding, Carrier, Radar), will be prepared in accordance with instructions on the back of the form.

e. DA AGO Form 11-239 (fig. 21), Second and Third Echelon Maintenance Check List for Signal Corps Equipment (Radio Communication, Direction Finding, Carrier, Radar), will be prepared in accordance with instructions on the back of the form.

f. Use other forms and records as authorized.

Section II. DESCRIPTION AND DATA

3. Purpose and Use

(figs. 1 and 2)

Radio Receiving Set AN/FRR-44 is a fixed f-m (frequency-modulated) radio set which operates at a preselected frequency within the range of 25 to 50 mc (megacycles). The set is designed to receive signals within the line of sight (distance range) under most conditions. Controls for operating the radio set are mounted on the front panel of Electrical Equipment Cabinet CY-1150/U. The radio set consists of a cabinet, a radio receiver, a receiver power supply, an an-

tenna, an antenna cable, and a power cable. External connections are required only for the antenna and the power source. By making the proper connections as described in paragraph 18, the radio set can be operated from either a 115- or 230-volt a-c (alternating current) source. Receiver Power Supply PP-846/U, plugs into the base assembly of Receiver R-257/U and the receiver plugs into Electrical Equipment Cabinet CY-1150/U. The radio set is useful in a repair depot as a test set-up for repairing and testing Radio Receiver R-257/U.



TM 229-2

Figure 2. Radio Receiving Set AN/FRR-44, rear view.

4. System Application (fig. 3)

a. Radio Receiving Set AN/FRR-44 is designed primarily for use as a monitoring system or receiving set for reception of transmissions

from radio sets of the nontactical series operating within the frequency range of 25 to 50 mc.

b. Figure 3 illustrates the nontactical application of Radio Receiving Set AN/FRR-44 and other radio sets in the nontactical group.

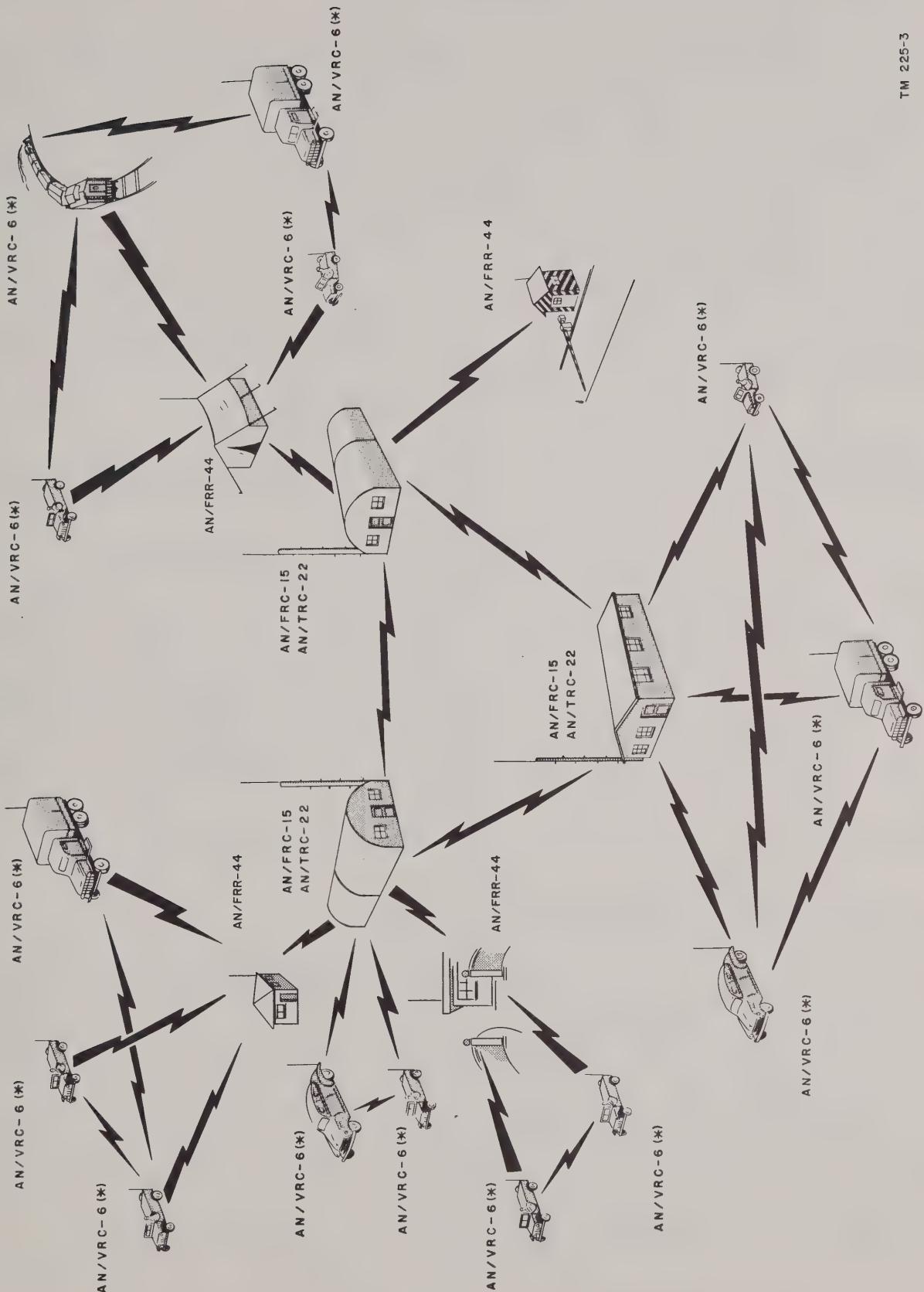


Figure 3. Nontactical system application.

5. Technical Characteristics of Radio Receiver R-257/U

6. Technical Characteristics of Power Supply PP-846/U

Power input..... 115 volts a-c, 46 volt-amperes, 50 to 65 cps.
..... 230 volts a-c, 46 volt-amperes, 50 to 65 cps.

Filament and heater circuit power drains:

6.3-volt filaments	0.45 ampere.
6.3-volt crystal heater	0.9 ampere.
1.4-volt filament	1.25 amperes.

Plate, screen grid, and bias circuit power drains:

160 volts d-c	15 ma.
155 volts d-c	5 ma.
145 volts d-c	50 ma.
-40 volts d-c	0.5 ma.

7. Packaging Data

(figs. 10 and 11)

Radio Receiving Set AN/FRR-44 is packaged for both domestic and export shipment when required. A single wooden crate divided into two compartments contains the cartons of components for export shipment, whereas in domestic packaging the wooden crate is replaced by a carton. The smaller individual cartons are packed the same way for either type of shipment. The antenna is packed in a separate wooden box for export shipment and in a separate carton for domestic shipment. Contents of all packages are stenciled directly on the box. A packing slip is stapled to the side of the case and protected with

a waterproof seal. An orange band painted around the box indicates that it is packaged for export shipment. Export packaging is labeled PACKAGED WITH A DEHYDRATING AGENT. DO NOT OPEN UNTIL READY FOR USE. An orange spot on the box means that the box is part of a shipment; each box is marked with a device such as 1/3, 2/3, and 3/3. This means that box number 1 is one box in a shipment of three, box number 2 is the second box in a shipment of 3, etc. In some instances the items may be packaged in a manner different from that shown, depending upon the supply channel. The size, weight, and volume of the crate or cartons are indicated in the following chart:

Packing and packaging							
Type of packaging	Number of crates	Contents	Height (in.)	Width (in.)	Length (in.)	Volume (cu. ft.)	Unit weight
Domestic (Order No. 11661-Phila-52-93)	2	Radio Set	15 1/8	10 3/4	30 3/8	2.86	83
		Antenna	11 1/2	5 1/4	41	1.43	30
Export (Order No. 11661-Phila-52-93)	2	Radio Set	15 7/8	11 7/8	38 1/4	4.17	110
		Antenna	11 1/2	5 1/4	41	1.43	30

8. Table of Components.

Component	Required No.	Height (in.)	Depth (in.)	Length (in.)	Volume (cu. ft.)	Unit weight (lb)
Electrical Equipment Cabinet CY-1150/U	1	10 5/8	21 1/4	7 1/2	1	14 1/2
Radio Receiver R-257/U	1	8 1/2	14 1/2	5 3/4	.42	17
Power Supply PP-846/U	1	5	6 1/4	7 1/16	.13	9 1/2
Cord CG-399A/U	1			68 ft 3 in.		6
Power Cord	1			15 ft		
Antenna AS-612/U	1	11 1/2	5 1/4	41	.20	30
Running spares, kit	1	6 3/8	6 3/8	4 3/4	.11	
Instruction book for Radio Receiving Set AN/FRR-44	2	11	1/4	8 1/2	.03	
Instruction book for Radio Receiver R-257/U	2	11	1/2	8 1/2	.06	
Instruction book for Power Supply PP-846/U	2	11	1/4	8 1/2	.03	
Total	13					77

Note. This list is for general information only. See appropriate supply publications for information pertaining to requisition of spare parts.

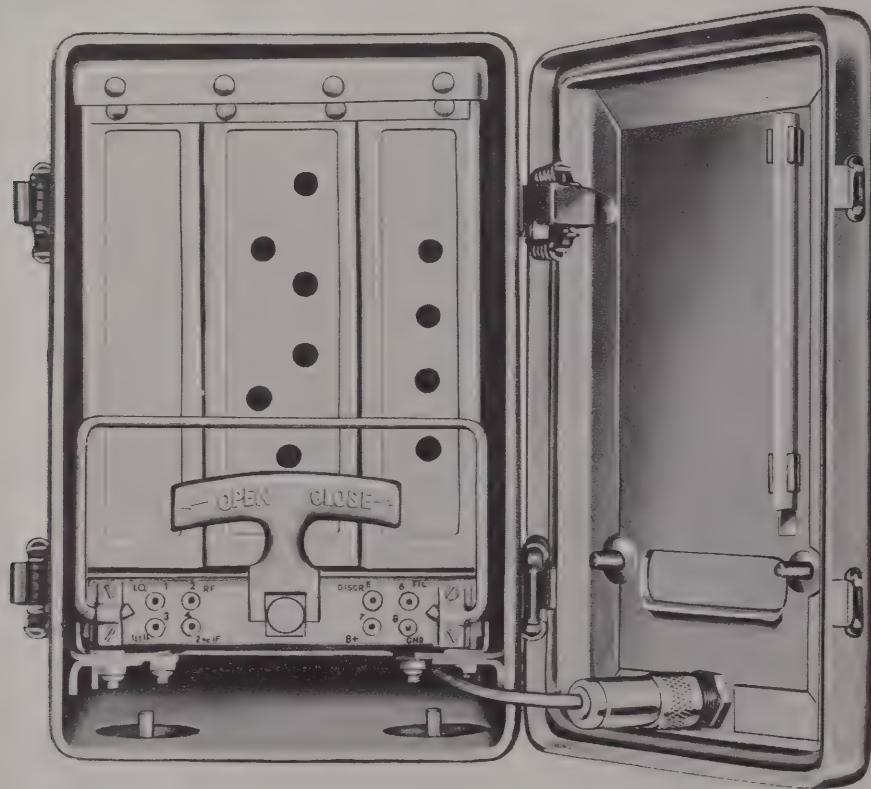
9. Description of Electrical Equipment Cabinet CY-1150/U (figs. 1, 2, and 4)

a. Electrical Equipment Cabinet CY-1150/U is an aluminum case painted with an olive drab semi-gloss enamel. It has one compartment which is designed to contain Radio Receiver R-257/U. The front cover contains a loudspeaker, a VOLUME control ganged with a power on-off switch, and a SQUELCH control and disable switch. The rear cover contains a coaxial connector for connecting the antenna transmission line, and an opening for admitting the power cable. Both the front and rear covers are fastened to the cabinet with four snap fasteners. When these covers are secured properly, the cabinet is moistureproof because of rubber gaskets between the cabinet and the front and rear covers. A handle on the front of the cabinet facilitates handling.

b. A connector inside the cabinet mates with the main receiver connector in Radio Receiver R-257/U. Connections in the cabinet complete the various circuits between the receiver, power supply, antenna, controls, and loudspeaker.

c. When the receiver is fitted into the cabinet, two tracks and two hold-down springs provide a firm mechanical seating. The lock-in rod in the receiver locks the receiver in the cabinet and thus prevents the receiver and cabinet connectors from becoming disengaged or damaged.

d. Radio Receiver R-257/U can be operated and tested with this cabinet and one of the three available d-c (direct-current) power supplies, or the a-c power supply. Power Supply PP-846/U (the a-c power supply) is one of the components of Radio Receiving Set AN/FRR-44.



TM 229-5

Figure 4. Radio Receiving Set AN/FRR-44, rear cover removed.

10. Description of Radio Receiver R-257/U

(figs. 5 and 6)

a. Radio Receiver R-257/U is a 21-tube f-m dual conversion superheterodyne receiver. It operates as a fixed frequency receiver within the frequency range of 25 to 50 mc. The h-f (high-frequency) oscillators are crystal-controlled to provide maximum stability. The receiver is connected to the radio set by means of a single connector on the rear panel. Connection is automatic when the receiver is installed in Electrical Equipment Cabinet CY-1150/U. All controls are mounted on the front panel of the cabinet.

b. The receiver is made up of a main chassis or base assembly with plug-in subassemblies for the various stages. The base has interconnecting

wiring and jacks to complete the signal and current paths through the receiver. Each subassembly occupies a shielded compartment and is further shielded by a metal sleeve between the subassembly and compartment walls. Such construction permits rapid servicing and a minimum of stock parts for replacement.

c. The receiver can be made to operate at different frequencies within the range from 25 to 50 mc. To accomplish this, it is necessary to change a crystal in the h-f oscillator and realine all the stages preceding the first mixer (par. 27). When changing from a frequency below 36 mc to one above 36 mc or vice versa, it is necessary to change jumper connections. *This operation must be performed by competent maintenance personnel.*

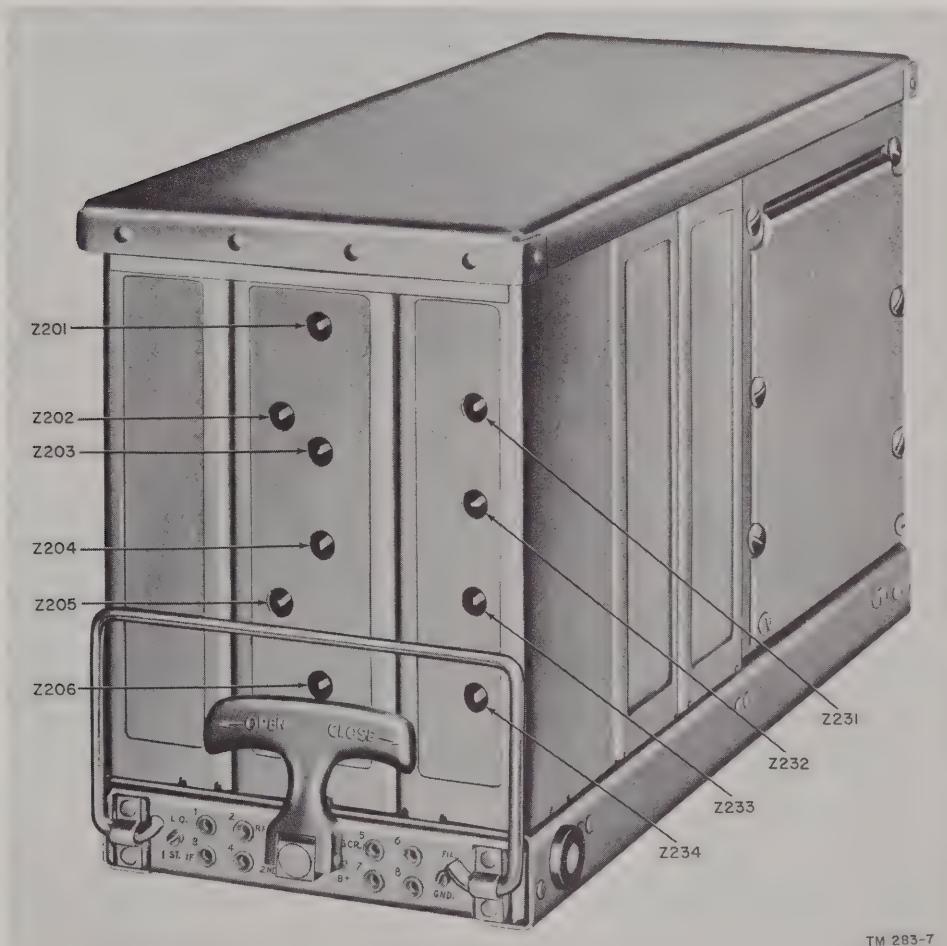
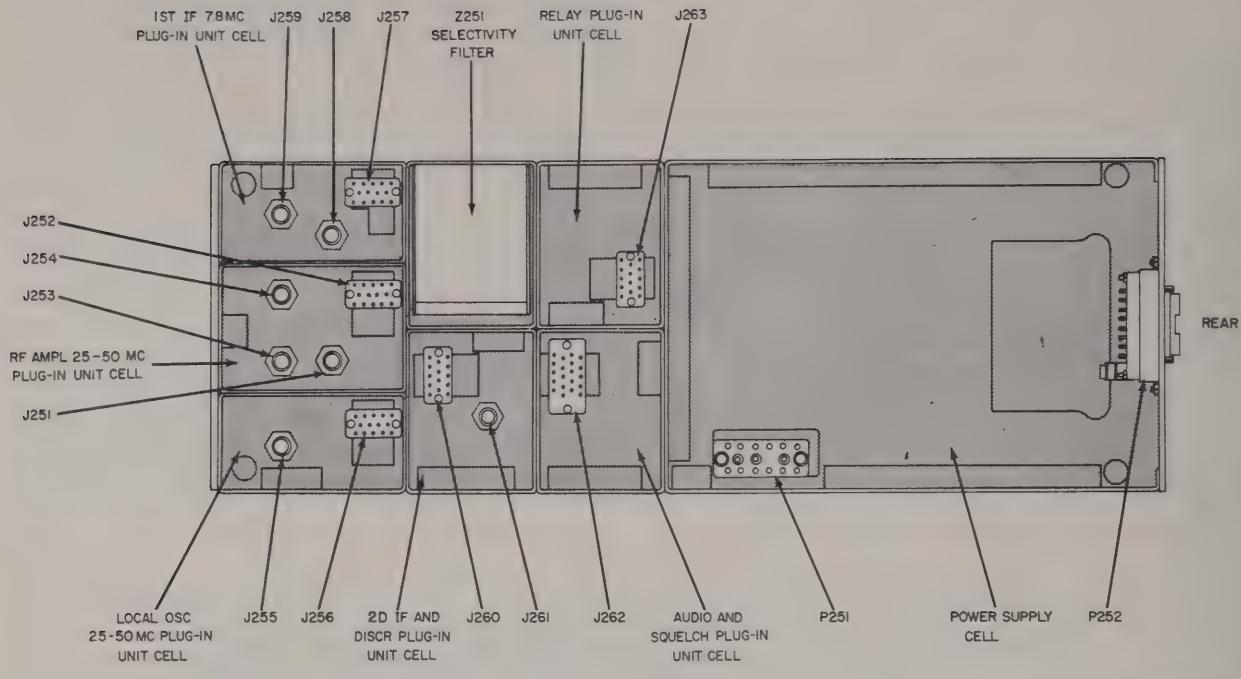


Figure 5. Radio Receiver R-257/U.



TM 6071-9

Figure 6. Radio Receiver R-257/U, top view, cover removed.

d. One of the receiver compartments is designed to accommodate the receiver power supply (a separate component). The power supply, which is plugged into the receiver, must be capable of operating at the correct input voltage for the radio set in which it is installed. The receiver is designed to use Power Supply PP-846/U when operating as part of Radio Receiving Set AN/FRR-44. See paragraph 11 for a description of the power supply.

11. Description of Power Supply PP-846/U (fig. 7)

Power Supply PP-846/U is an a-c power supply designed to operate from a 115-volt or 230-volt a-c power source. It consists of a chassis on which are mounted the various parts necessary for transforming, rectifying, filtering, and regulating the voltages required by Radio Receiver R-257/U. A compartment is provided for the power supply in the receiver base. The power supply is fastened to the receiver base with six 10-32 screws. Input and output power connec-

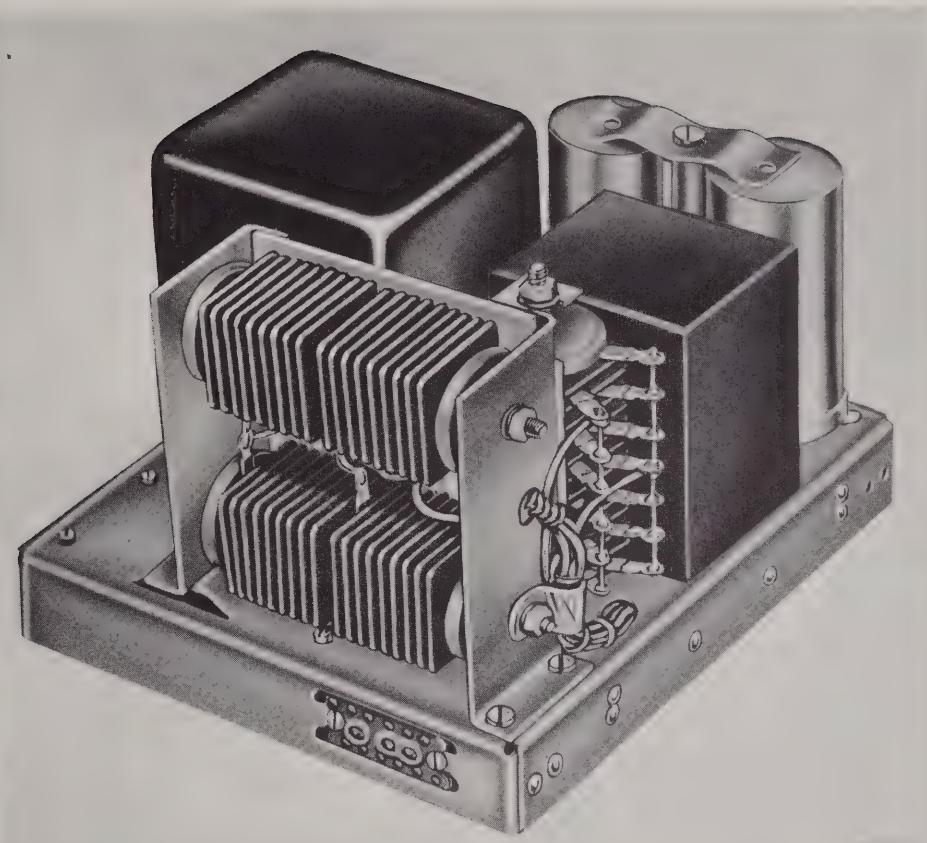
tions between the power supply and the receiver base are made by a multiple connector on the power supply which mates with another connector in the receiver base.

12. Electrical Cables

(fig. 8)

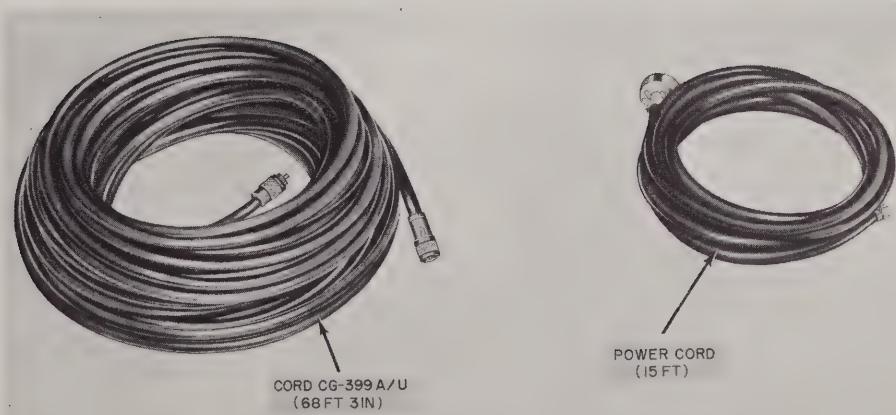
a. *Power Cable.* The a-c power cable supplied with the radio set is made of heavy duty rubber covered wire. Its standard length is 15 feet. A male two-prong plug is attached to one end for connection to an a-c outlet. The other end has a lug type terminal on each wire for connection to a terminal board in Electrical Equipment Cabinet CY-1150/U (par. 18).

b. *Coaxial Cable.* The radio set is connected to the antenna with a 68-foot, 3-inch length of Radio Frequency Cable RG-8A/U (Cord CG-399A/U). This cable has Radio Frequency Plug UG-21B/U on one end and Plug PL-259 on the other end. The cable has a characteristic impedance of 52 ohms which is suitable for matching the radio set to Antenna AS-612/U.



TM 5078-1

Figure 7. Power Supply PP-846/U.



TM 225-8

Figure 8. Radio Receiving Set AN/FRR-44, electrical cables.

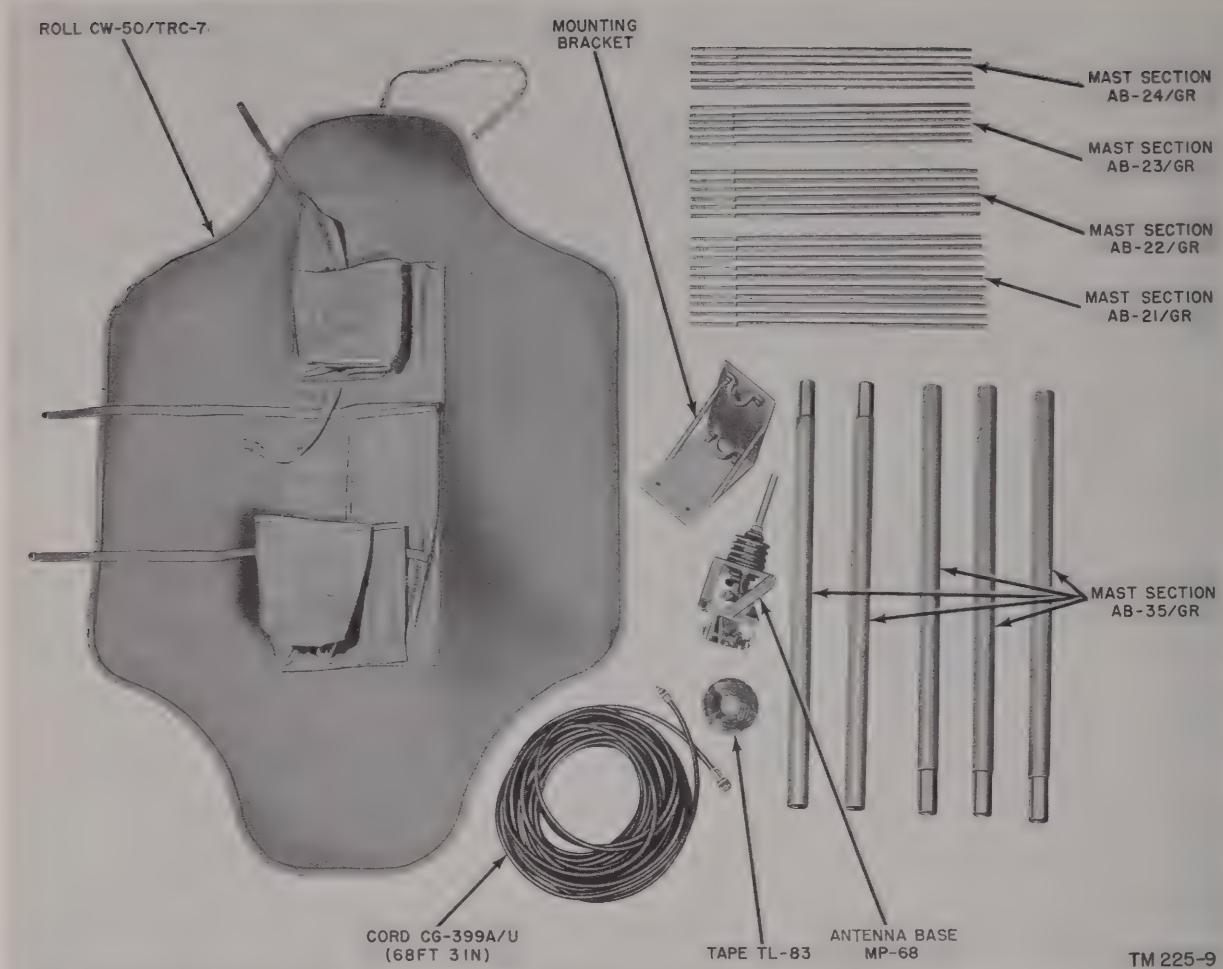


Figure 9. Antenna AS-612/U.

13. Description of Antenna AS-612/U

(figs. 9 and 14)

a. General. Antenna AS-612/U is a quarter-wave vertical antenna capable of operating in the 25- to 50-mc range. An omnidirectional radiation pattern with a low radiation angle is obtained by using a vertical whip as the radiating element and three similar elements spaced 120° apart acting as ground plane rods. The length of the whip element and the ground plane elements depends on the operating frequency, varying from approximately 9 feet at 25 mc to approximately 6 feet at 50 mc. The entire range of operation is covered in four steps; 25 to 29 mc, 29 to 36 mc, 36 to 42 mc, and 42 to 50 mc. Changing from one band to another is accomplished by the addition or

removal of the sections which comprise the radiating element and ground planes. A right-angle bracket, which holds the supporting structure, may be fixed to either a horizontal or vertical surface, affording flexibility of installation. The bracket is fastened to the mounting surface by four bolts. If a masonry surface is chosen as the mounting site, four expansion-type bolts should be used for attaching the bracket. In normal installations, the supporting structure for the antenna is made up of three mast sections, each 33 inches long. The first of these sections is fastened to the mounted bracket by two U-shaped clamps furnished with the bracket. The mast base, on which the vertical whip and ground planes are mounted, is attached to the last mast section by means of U clamps. Using three mast

sections, the vertical whip and ground plane are approximately 8 feet above the mounting surface or angle bracket. An additional 5½ feet of height can be obtained by using the two additional mast sections provided. Connection between the transmitter and antenna is made by Radio Frequency Cable RG-8A/U (68 feet, 3 inches long). The cable is secured to the antenna mounting mast at appropriate intervals with friction tape. All exposed surfaces of the antenna have been treated to withstand adverse climatic conditions. Antenna AS-612/U is composed of the following:

Description	Quantity	Spares
Antenna Base MP-68	1	0
Mounting Bracket	1	0
Mast Section AB-35/GR	3	2
Mast Section AB-21/GR	8	2
Mast Section AB-22/GR	4	2
Mast Section AB-23/GR	4	2
Mast Section AB-24/GR	4	2
Radio Frequency Cable RG-8A/U	1	0
Tape TL-83 (Grade A)	1	0
Roll CW-50/TRC-7	1	0

b. Mounting Bracket. The mounting bracket is of one piece, steel construction, L-shape, with an olive drab enamel finish. It holds the antenna mounting section by two U-shaped clamps. Eight ½-inch mounting holes are provided for either horizontal or vertical mounting.

c. Mast Section AB-35/GR. Mast Section AB-35/GR is used as part of the supporting structure. It is made of tubular aluminum 1 ¾ inches in diameter and 33 inches long. A steel insert at one end forms a coupling over which the next section is placed. The diameter of the insert is 1 ½ inches.

d. Mast Section AB-21/GR. Mast Section AB-21/GR is a part of the ground planes and the antenna proper. This mast section is 23½ inches long and about ½ inch in diameter. One end has a male thread 1 5/16 inches long which, in the case

of the antenna proper, is screwed into the insulator mounted on Antenna Base MP-68. In the case of the ground planes, this mast section is screwed into the threaded portions of Antenna Base MP-68. The other end of Mast Section AB-21/GR has a female thread into which an additional mast section may be screwed.

e. Mast Section AB-22/GR. Mast Section AB-22/GR is designed as part of the ground planes and antenna proper. The mast section is 23½ inches long and approximately ½ inch in diameter. One end has a male thread and the other end has a female thread. The end with the male thread screws into Mast Section AB-21/GR and the female threaded end accommodates Mast Section AB-23/GR.

f. Mast Section AB-23/GR. Mast Section AB-23/GR is a part of the ground planes and antenna proper. The over-all length is 23½ inches and the diameter is about ½ inch. Each end of this mast section is threaded. The end with the male thread is screwed into Mast Section AB-22/GR. The female threaded end accommodates Mast Section AB-24/GR.

g. Mast Section AB-24/GR. Mast Section AB-24/GR is similar to Mast Sections AB-21/GR, -22/GR, and -23/GR. Its length is 23½ inches and its diameter is approximately ½ inch. One end of this mast section has a male thread which screws into Mast Section AB-23/GR.

h. Radio Frequency Cable Assembly. This is a coaxial cable with a characteristic impedance of 52 ohms. It is designed to operate with a maximum of 4,000 volts rms (root mean square) applied. The single conductor is composed of 7 strands of #21 AWG copper wire. The dielectric material is made of polyethylene and it is covered with a copper shield. The assembly is 68 feet, 3 inches long, excluding the terminals. One end is terminated in Plug PL-259. The other end is terminated in Radio Frequency Plug UG-21B/U.

i. Tape TL-83. This is a roll of friction tape that is used to tie the coaxial cable to the supporting mast.

j. Roll CW-50/TRC-7. This is a canvas bag which is used to carry all the components of the antenna. It has four straps for tying the bag securely. A canvas strap is provided for ease in carrying.

14. Running spares

Running spares are provided for Radio Receiving Set AN/FRR-44. These spares are provided for normally expendable items, such as tubes, fuses, and pilot lamps. Following is a list of the running spares for each radio receiving set:

2 tubes, 1AD4

1 tube, 5840

4 tubes, 5678

1 tube, 6AK6

1 tube, 5672

1 lamp, G.E. #47, 6 to 8 volts, .15 ampere.

5 fuses, cartridge, 2 amperes, $1\frac{1}{4}$ -inches long by $\frac{1}{4}$ -inch diameter, stock number 3Z2602.29.

CHAPTER 2

OPERATING INSTRUCTIONS

Section I. SERVICE UPON RECEIPT OF MATERIEL

15. Siting

a. *External Requirements.* The best location for radio equipment depends on the tactical situation and local conditions, such as the following: need for concealment from enemy observation, the type of housing available, possible installation in a vehicle, the terrain, and the need for easy access to messengers. Signals received on Radio Receiving Set AN/FRR-44 have a greater range if the antenna is high and clear of hills, buildings, cliffs, densely wooded areas, and other obstructions. Depressions, valleys, and other low places are poor locations for radio reception and transmission because the surrounding high terrain absorbs r-f (radio frequency) energy. Weak or otherwise undesirable signals may be expected if the set is operated under or close to steel bridges, underpasses, power lines, or power units. Choose, if possible, a location on a hilltop or elevation. Flat ground is desirable. Normally, transmission over water is better than transmission over land. See that drainage is adequate to prevent flooding the interior of the shelter. If the equipment is part of a communication center but is not installed within the center, locate the equipment nearby. In locating the antenna avoid obstructions between the transmitter and the receiving set.

b. *Interior Requirements.* The shelter for the equipment must meet the following requirements:

- (1) A table or bench must be provided for mounting the radio receiving set. It must be free of vibration and sturdy enough to support the weight of the equipment.
- (2) Sufficient space must be provided on the operating table or bench in order that the receiver may be withdrawn from the cabinet.

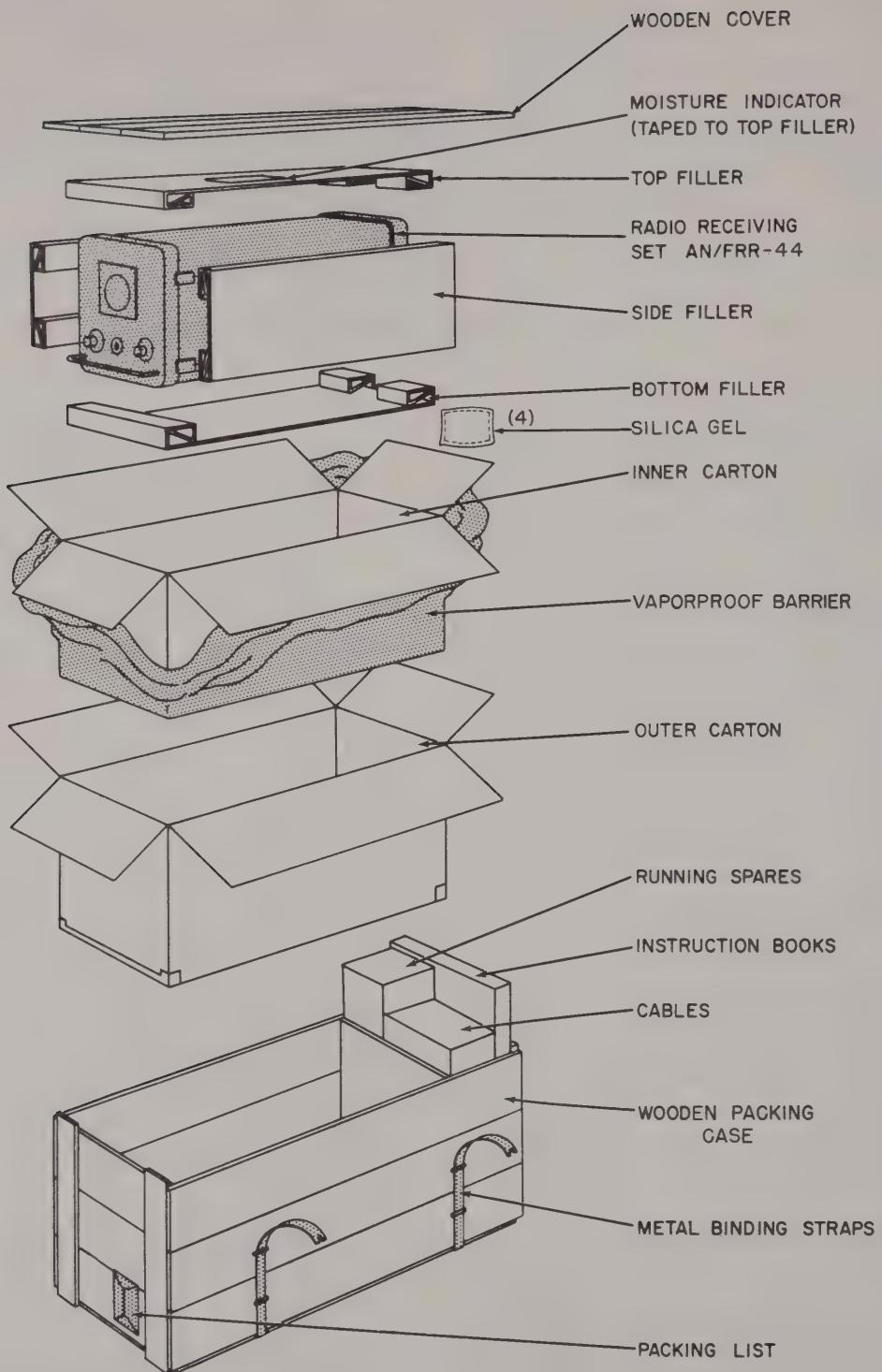
(3) Protection from damp walls should be provided. Never locate the equipment near walls which show evidence of seepage or water flow from a leaking ceiling. If it is necessary to utilize a building with a concrete floor, locate the equipment where the floor appears driest.

16. Uncrating, Unpacking and Checking New Equipment (figs. 10 and 11)

Caution: Rough handling during the unpacking process may damage the radio receiving set. Take every precaution to prevent damage. If possible, unpack the equipment in a location which is free from dust, dirt, and moisture.

a. *Unpacking.* Exploded views of the crates which contain the components of Radio Receiving Set AN/FRR-44 are shown in figures 10 and 11 as an aid in unpacking the equipment. These illustrations show the locations of the various cartons and the method by which the packing materials are assembled. Antenna AS-612/U and its mast are packaged as shown in figure 11. Use the following procedure for unpacking the radio set:

- (1) Cut the metal bands or wires which encircle the wooden crate; use a pair of tin snips or a large pair of diagonal cutting pliers.
- (2) Pry open the top cover; be careful not to force the prying instrument too far into the package. Use a nail puller if one is available. Remove the top cover and save it for future repacking. Save all the packing material except the silica gel (dehydrating agent).



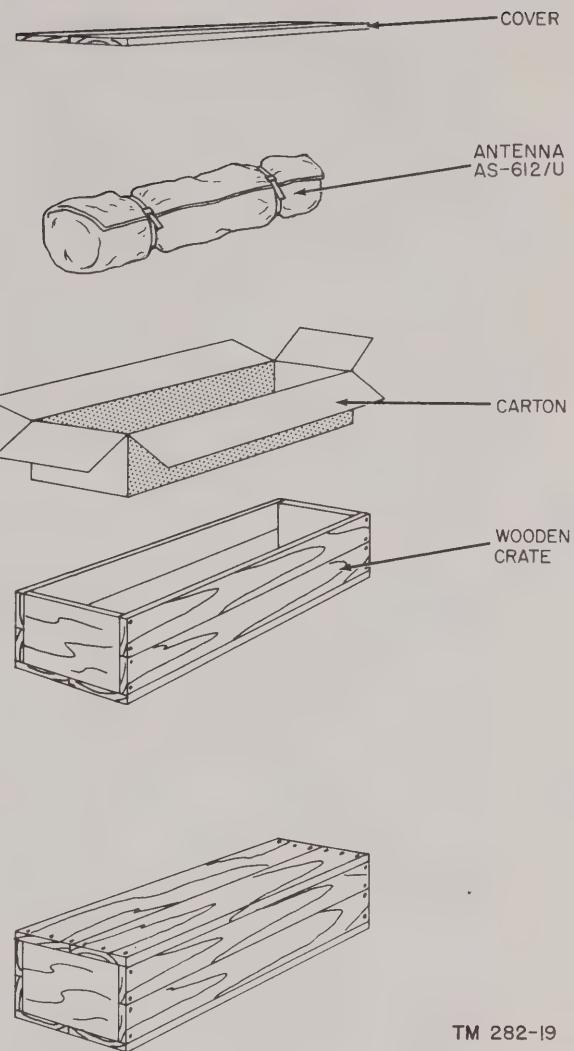
TM 225-10

Figure 10. Packaging for Radio Receiving Set AN/FRR-44.

- (3) Open the flaps on the top of the outer carton.
- (4) Open the moisture-vaporproof bag by slitting it along the edge of its seal. Remove the inner carton containing the equipment. Remove the radio set from the inner carton with care to avoid damage to the cabinet.
- (5) When all packing material is removed from the components, the unpacking procedure is complete and the radio set can be checked for damage.

b. Checking. Be sure that all parts listed in the packing list are included. The packing list is in an envelope tacked to the outside of the crate. Check the equipment for damage which may have occurred during shipment. Remove the front and rear covers from the cabinet so that inspection can be made. The front and rear covers are removed by releasing the four snap fasteners at each end. Remove each component and examine it for damage. This damage may consist of broken tubes, resistors, cut wires, shorted terminals, smashed transformer can, etc. Remove the receiver by rotating the lock-in rod handle 360° in a counter-clockwise direction. The receiver then may be pulled out without disconnecting any wires since all connections are made by means of the plug at the rear of the component. The receiver top cover is held on by a single latch at the rear of the receiver. Removing this cover allows any of the plug-in units to be pulled out with the exception of the receiver power supply. To remove the power supply, it is necessary to take out six screws. The power supply then can be removed from the chassis, and at the same time, the plug to the receiver base will be disconnected. When all the components have been checked and it is reasonably sure that there is no damage, replace them by reversing the procedure used for disassembly.

c. Repacking. If it is necessary to repack the radio receiving set and the spare parts, the original packing materials should be included if possible. Refer to figures 10 and 11 as a guide for the reassembly of the packages. Be sure to use sufficient padding. The moisture-vaporproof bags should be sealed with a tape that is designed for this type of seal. Fresh silica gel should be placed inside the moisture-vaporproof bag if it is available.



TM 282-19

Figure 11. Packaging for Antenna AS-612/U.

17. Installation of Radio Receiving Set AN/FRR-44

(figs. 12, 13, and 14)

a. Checking Components. Inspect the exterior and interior of each component for damage or otherwise abnormal conditions. Release the four latches on the rear cover of the radio set. The receiver is removed from the cabinet by turning the lock-in rod handle counterclockwise, as shown on the knob, and pulling forward.

- (1) *Radio Receiver R-257/U.* This receiver is shipped installed in Electrical Equipment Cabinet CY-1150/U. The top cover is secured in place with a latch at the rear of the receiver. The bottom is fastened

with six Airloc fasteners. Remove the top and bottom covers and inspect them for damage, dirt, and moisture. Remove the plug-in units and slide off the rectangular metal sleeves which shield them. Remove each sleeve by means of the handle and inspect each plug-in unit. At this point the LOCAL OSC 25-50 MC plug-in unit can be checked for the proper crystal. If the crystal is to be replaced by another of a different frequency, do it now. The LOCAL OSC 25-50 MC and the RF AMPL 25-50 MC plug-in units have holes in their protective sleeves which permit frequency-changing alignment to be performed after the receiver is completely reassembled.

(2) *Power Supply PP-846/U.* This power supply is shipped mounted in the receiver base. Remove the side cover of the receiver and inspect the bottom side of the power supply. Most of the parts on the top of the chassis can be seen by looking down into the power supply compartment of the receiver. If further examination of the power supply is necessary, unplug the power supply connector located at the bottom of the receiver, then remove the six 10-32 screws, and lift the power supply out of the receiver base. If one of the receiver d-c power supplies is to be used instead of Power Supply PP-846/U, install it in the receiver now.

(3) *Electrical Equipment Cabinet CY-1150/U.*

The cabinet can be thoroughly inspected for damage when the receiver is removed. Release the four latches on the front cover. Inspect the interior for damage and abnormal conditions.

(4) *Antenna AS-612/U.* Check the antenna assembly for completeness and possible damage to its parts, such as the coaxial connector, insulators and rods. Check contents of the hardware bag.

(5) *Accessories.* Check all other equipment, such as spares and cables for completeness and damage.

b. *Mounting Radio Set.* When desired, Radio Receiving Set AN/FRR-44 may be fastened to a bench or a table top with four 8-32 mounting screws. Refer to figure 12 for the location of the mounting holes. Over-all dimensions of the radio set are shown on figure 13.

c. *Antenna Installation Procedure (fig. 14).*

- (1) Fasten the mounting bracket securely to the mounting surface, using four lead anchors.
- (2) Loosen the U-shaped clamps on the mounting bracket.
- (3) Secure Mast Section AB-35/GR to the mounting bracket with the U-shaped clamps.

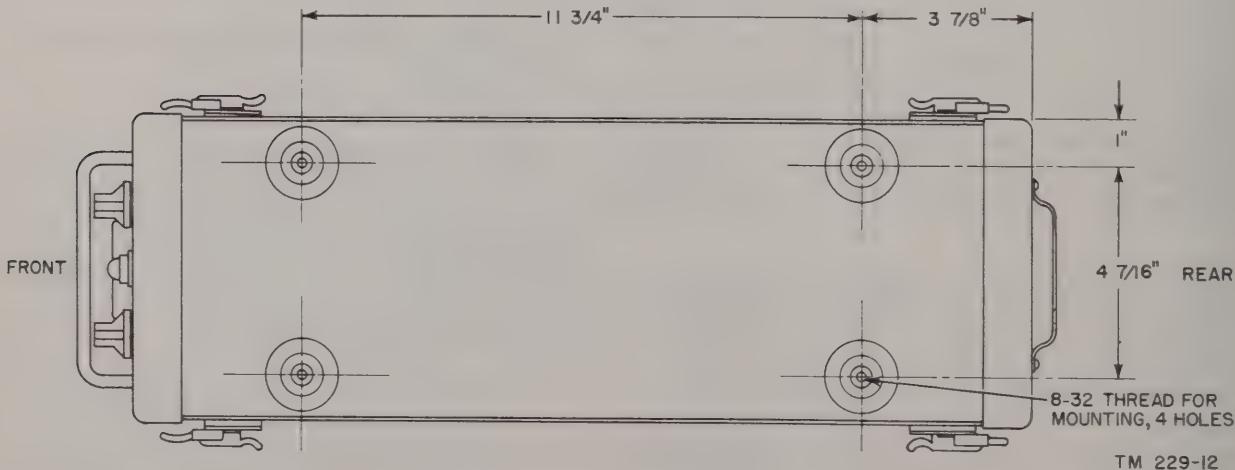


Figure 12. Radio Receiving Set AN/FRR-44, mounting dimensions.

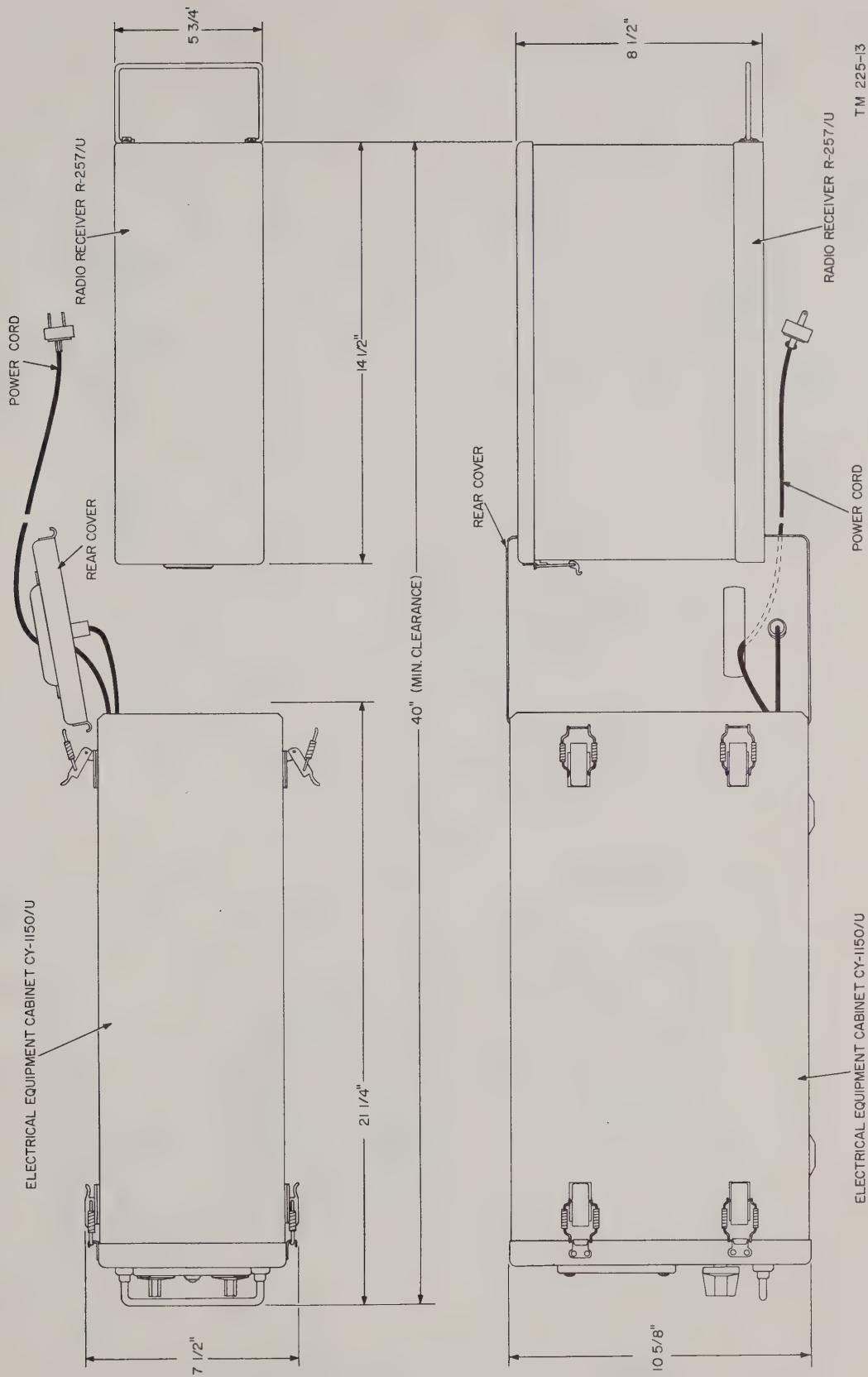
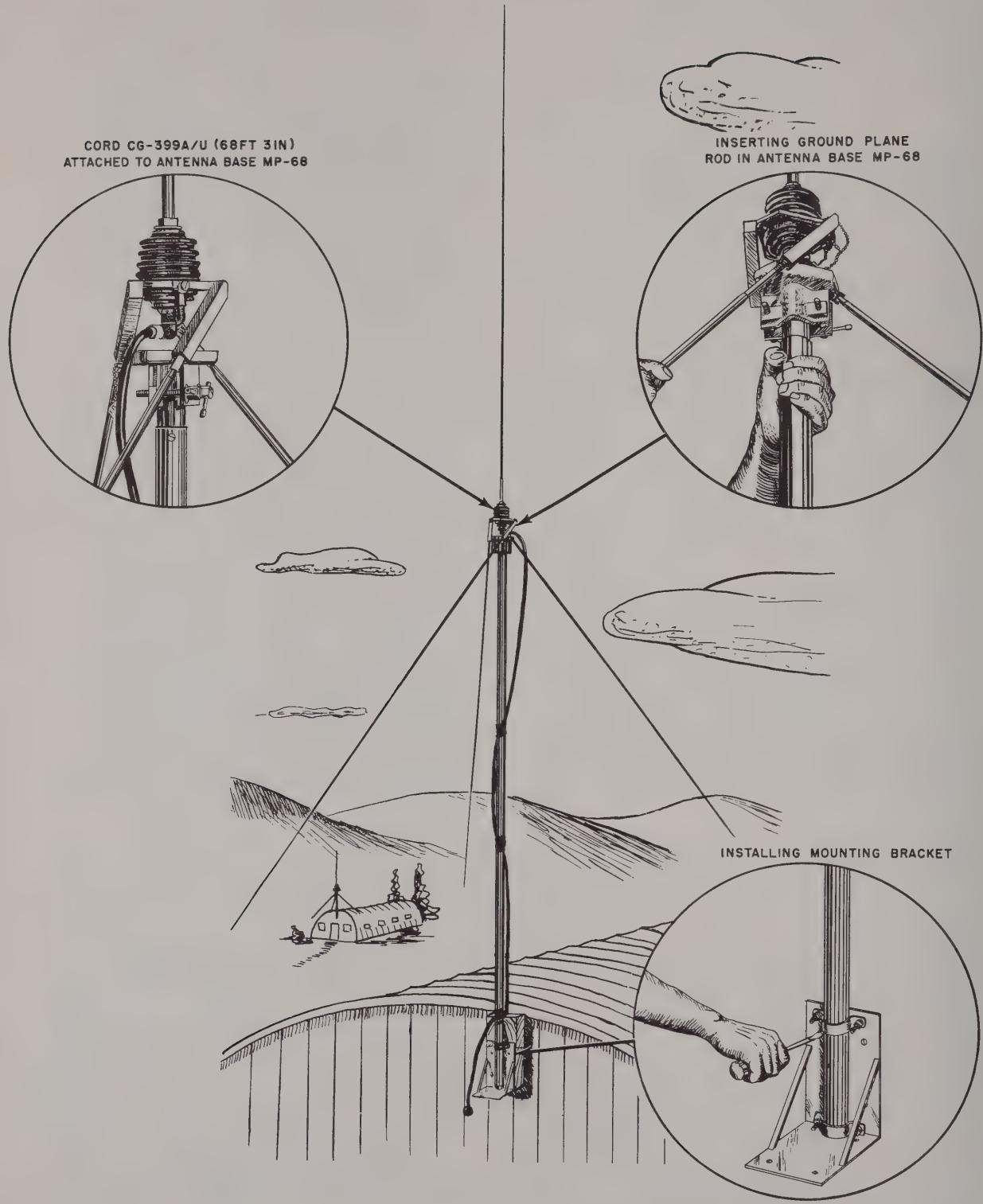


Figure 13. Radio Receiving Set AN/FRR-44, installation dimensions.



TM 225-14

Figure 14. Antenna AS-612/U, assembly and installation.

(4) Add another Mast Section AB-35/GR to the one already mounted.

(5) Before placing the third mast section in place, attach Antenna Base MP-68 to this mast section by means of the two pipe vise type clamps.

(6) Unscrew the protective cap from the insulator and attach the coaxial connector to the mast base.

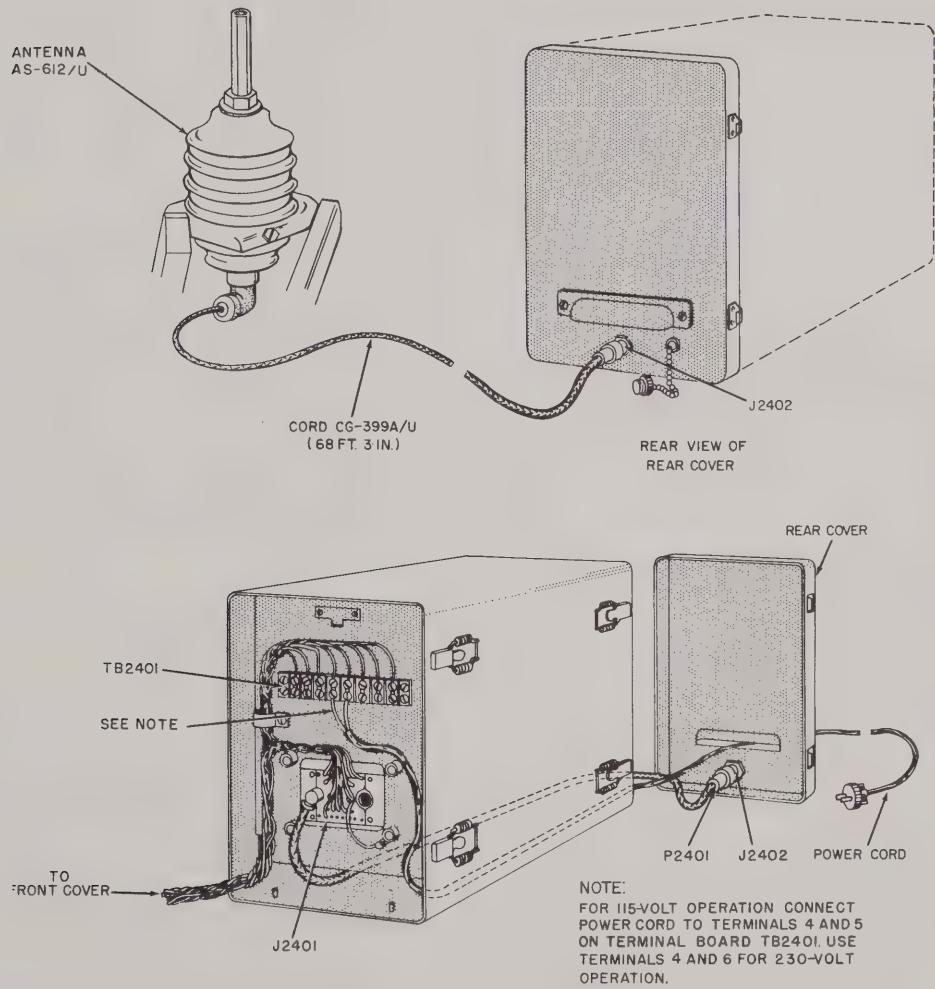
(7) Tighten the screw holding the ground strap to the mast base.

(8) Tape the coaxial cable to Mast Section AB-35/GR.

(9) Attach the whip and ground plane sections. Refer to the antenna assembly chart for the proper sections for the desired operating frequency.

Antenna Assembly Chart

Frequency	Vertical whip	Ground plane whips (3)
25 to 29 mc	2 MS-21/GR 1 MS-22/GR 1 MS-23/GR 1 MS-24/GR	2 MS-21/GR 1 MS-22/GR 1 MS-23/GR 1 MS-24/GR
29 to 36 mc	1 MS-21/GR 1 MS-22/GR 1 MS-23/GR 1 MS-24/GR	2 MS-21/GR 1 MS-22/GR 1 MS-23/GR 1 MS-24/GR



TM 225-15

Figure 15. Radio Receiving Set AN/FRR-44, connections.

Antenna Assembly Chart (contd)

Frequency	Vertical whip	Ground plane whips (3)
36 to 42 mc	1 MS-22/GR 1 MS-23/GR 1 MS-24/GR	1 MS-21/GR 1 MS-22/GR 1 MS-23/GR 1 MS-24/GR
42 to 50 mc	1 MS-22/GR 1 MS-23/GR 1 MS-24/GR	1 MS-22/GR 1 MS-23/GR 1 MS-24/GR

- (10) Mount this assembly to Antenna Base MP-68.
- (11) Tape the coaxial cable to the mast sections at approximately one foot intervals.

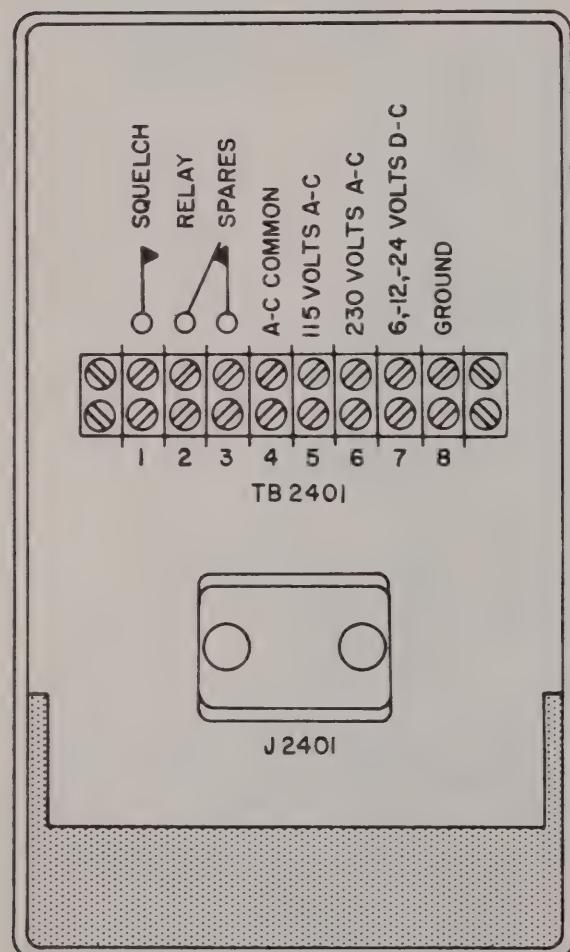


Figure 16. Radio Receiving Set AN/FRR-44, front panel terminal board.

- (12) Attach a piece of wire from the mounting bracket to a good ground as a protective measure.

18. Connections and Interconnections

(figs. 15 and 16)

a. Power Cord. Feed the power cord through Electrical Equipment Cabinet CY-1150/U to terminal board TB2401 as shown in figure 15. If the a-c power source is 115 volts, connect the ends of the cord to terminals 4 and 5. If the power source is 230 volts, connect the ends of the cord to terminals 4 and 6.

b. Antenna Cable. Connect the antenna cable to J2402 on the rear cover of the cabinet (fig. 15). Be sure that P2401 is connected to J2402 on the inner side of the rear cover.

c. Relay Connections. If the receiver relay, K271, is used for retransmission purposes or for a call light, it will be necessary to feed the external connected wires through the louver in the rear cover. Refer to the schematic diagram for Electrical Equipment Cabinet CY-1150/U (fig. 30) when making these connections.

d. D-c Connections. In the event that 6, 12, or 24 volts d-c are to be used for power, the d-c power can be wired to terminal board TB2401 through the rear cover louver (figs. 16 and 30). Connect the + lead to terminal 7 of TB2401 and connect the - lead to terminal 8.

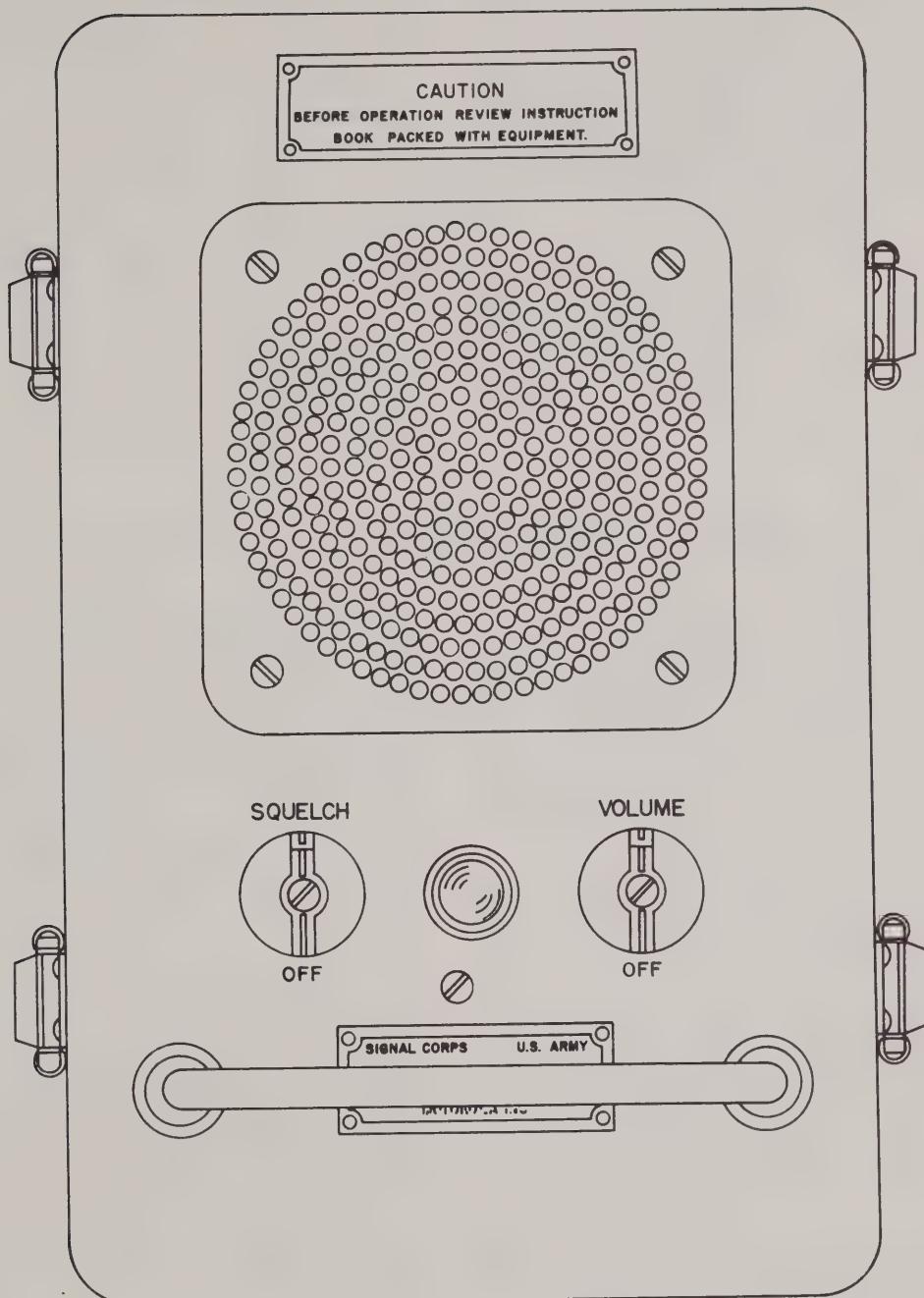
Note. Should d-c power be employed, the receiver power supply must be changed and connected for the d-c power source used. Use Power Supply PP-867/U with a 24-volt supply, PP-868/U with a 12-volt supply, and PP-869/U with a 6-volt supply.

19. Service Upon Receipt of Used or Reconditioned Equipment

a. Follow the instructions in paragraph 16 for uncrating, unpacking, and checking the equipment.

b. Check the used or reconditioned equipment for tags or other indications pertaining to changes in the wiring of the equipment. If any changes have been made, note the change in the instruction book, preferably on the schematic diagram.

c. If a new Radio Receiver R-257/U is available, compare the reconditioned receiver with the new receiver. Refer to the final testing section in the instruction book for Radio Receiver R-257/U.



TM 5092-530

Figure 17. Radio Receiving Set AN-FRR-44, controls.

d. Perform the installation and connection procedures given in paragraphs 17 and 18.

20. Controls and Their Uses

(fig. 17)

The following table lists the controls of Radio Receiving Set AN/FRR-44. These are mounted on Electrical Equipment Cabinet CY-1150/U and are similar to the controls in the other radio sets which use Radio Receiver R-257/U.

Control	Function
SQUELCH control (R2408)	Sets the squelch threshold or sensitivity level, as determined by the operator of the receiver. Minimum squelch action is in the clockwise direction.

Control	Function
SQUELCH-OFF switch (S2402)	Ganged to R2408. In the extreme clockwise position, the switch is closed and prevents the squelch circuit from operating.
VOLUME control (S2401A)	Audio level step attenuator. Operator has option of four fixed audio levels. Maximum volume is in the extreme clockwise position.
POWER-OFF switch (S2401B)	Ganged with VOLUME control. In extreme counterclockwise position, the switch opens the circuit to the a-c or d-c power source.
POWER indicator lamp	Lamp lights when power is turned on.

Section II. OPERATION UNDER USUAL CONDITIONS

21. Initial Adjustment of Receiver

The only initial adjustment required for Radio Receiving Set AN/FRR-44 consists of checking or setting the frequency of Radio Receiver R-257/U. If it is necessary to set the receiver to a different frequency, follow the procedure described in paragraph 27. *This procedure should be performed only by qualified personnel.*

a. Remove the LOCAL OSC 25-50 MC plug-in unit, and remove its shield cover.

b. Remove the crystal oven (E231) and its cover.

c. Remove the crystal (Y231) and insert the new crystal. Be sure the crystal and the thermostat (similar in appearance) are not reversed. The crystal frequency is determined by this formula:

$$\text{Crystal frequency} = \frac{F + 7.8 \text{ mc}}{2}$$

where crystal frequency is the frequency of the crystal which is to be found and F is the desired signal frequency in megacycles.

d. Reassemble the oven and replace it in the octal socket in the plug-in unit. Replace the shield cover and insert the plug-in unit in the receiver.

e. Connect the receiver to the cabinet with the patch cord (Electrical Special Purpose Cable Assembly CX-2371/U) and align the LOCAL

OSC 25-50 MC plug-in unit and the RF AMPL 25-50 MC plug-in unit as described in the instruction book for Radio Receiver R-257/U.

f. Refer to paragraph 27 for the alignment procedures for the RF AMPL 25-50 MC and the LOCAL OSC 25-50 MC plug-in units.

g. Refer to the instruction book for Radio Receiver R-257/U for further information pertaining to the receiver theory, alignment and adjustment.

22. Receiver Test Points

a. There are eight test jacks on the front of Radio Receiver R-257/U, as shown in figure 18. These test points aid in testing and aligning the receiver. R-f (radio-frequency) or i-f (intermediate-frequency) signals are decoupled from these test points to prevent loading or detuning of the circuits involved. A quick check for B+ and filament voltages also can be made at these test points.

b. The repairman should study the instruction book for Radio Receiver R-257/U in order to become familiar with the features and details of the receiver. Examination of the schematic diagram for Radio Receiver R-257/U (fig. 29) will indicate the test points and their connections in the receiver circuit.

23. Starting Procedure

a. *Preliminary.* Set the controls on the front panel of Electrical Equipment Cabinet CY-1150/U as follows:

Control	Position
VOLUME	OFF
SQUELCH	OFF

b. *Starting.* Turn the VOLUME control to the third or fourth position clockwise. The POWER indicator lamp will light and a signal or rushing noise should be heard from the speaker within 15 or 20 seconds.

24. Volume Adjustment

The volume of the receiver is adjusted by advancing the VOLUME switch clockwise for more output. The operator has an option of four audio volume levels. The lowest volume level is the first position clockwise from the OFF position, and the maximum volume level is obtained when the switch is fully clockwise. Adjust the control for a comfortable audio level.

25. Squelch Adjustment

When the SQUELCH control is in the OFF position, the receiver cannot be squelched. This permits the receiver to operate even in the absence of a received signal. The SQUELCH control is adjusted to mute the receiver output (rushing noise) when no signal is being received. Turn the SQUELCH control to its maximum clockwise position and then slowly counterclockwise until the rushing noise stops. The setting at which this occurs is called the squelch threshold level. Do not turn this control past the point where the rushing noise stops, or weak signals will not be heard.

26. Stopping Procedure

a. Turn the SQUELCH control clockwise to its OFF position.

b. Turn the VOLUME control counterclockwise to its OFF position.

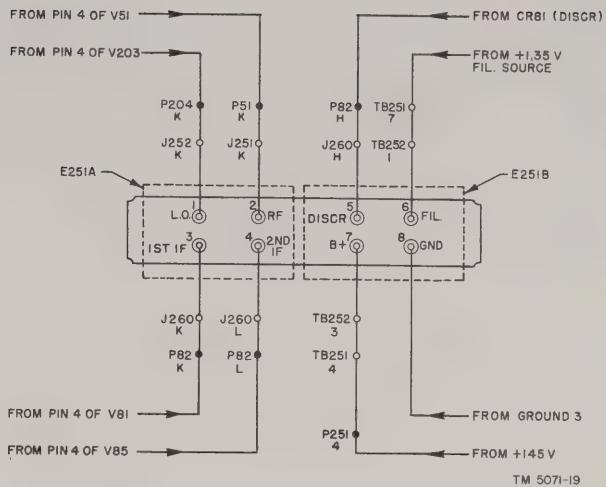


Figure 18. Radio Receiver R-257/U, test points.

27. Changing Receiver Frequency (fig. 19)

a. *Preliminary Procedures.* The following preliminary steps should be taken:

- (1) Release the receiver from Electrical Equipment Cabinet CY-1150/U by turning the hold-in lock handle counterclockwise. The receiver then may be pulled out of the cabinet by use of the folding handle located on the front panel.
- (2) Remove the top cover and the two plug-in units marked LOCAL OSC 25-50 MC and RF AMPL 25-50 MC. Remove the shields from these plug-in units.
- (3) Remove crystal thermostat assembly E231 from the LOCAL OSC 25-50 MC plug-in unit. Remove its cover plate and replace crystal Y231 with the new crystal. Be sure not to reverse the crystal and the thermostat (similar in appearance). The crystal frequency is determined by the following formula:

$$\text{Crystal frequency (mc)} = \frac{F + 7.8}{2}$$

where F = frequency (mc) of operation desired.

- (4) Reassemble crystal thermostat assembly E231 and replace it in the octal socket in the plug-in unit.
- (5) Use Electrical Special Purpose Cable Assembly CX-2371/U to complete the

connections from the receiver to Electrical Equipment Cabinet CY-1150/U (fig. 25). This special purpose cable will be listed in SIG 7 & 8-AN/FRR-44 (when published) and can be requisitioned through normal supply channels.

b. H-f Oscillator and Multiplier Alinement Procedure.

- (1) If the receiver is to be operated at a frequency between 25 and 35 mc, the jumpers must be connected as follows: on the LOCAL OSC 25-50 MC plug-in unit, jumpers across Z231, Z232, Z233, and Z234, and no jumper across L234; on the RF AMPL 25-50 MC plug-in unit, jumpers across Z201, Z202, Z203, Z204, and Z205 (fig. 19).
- (2) If the receiver is to be operated at a frequency between 35 and 50 mc, the jumpers must be connected as follows: the LOCAL OSC 25-50 MC plug-in unit, a jumper across L234 and no jumpers across Z231, Z232, Z233, and Z234; on the RF AMPL 25-50 MC

plug-in unit, no jumpers across Z201, Z202, Z203, Z204, and Z205 (fig. 19).

- (3) Reinsert the LOCAL OSC 25-50 MC and the RF AMPL 25-50 MC plug-in units in their proper compartments in the receiver. Replace the shield on the RF AMPL 25-50 MC plug-in unit but not on the LOCAL OSC 25-50 MC plug-in unit.
- (4) When a new operating frequency is to be used, Z231 through Z234 must be retuned. The procedure consists of an approximate adjustment which tunes the oscillator close to the desired frequency and a precise adjustment which tunes the oscillator exactly to the desired frequency. A vtvm (vacuum-tube voltmeter) is connected to the terminals indicated in the chart below, to give tuning indications. It is important that the proper crystal be inserted in the crystal thermostat assembly. Otherwise, it will be impossible to tune the oscillator to the desired frequency. The adjustment locations are shown on figure 19. Use the following sequence of adjustments:

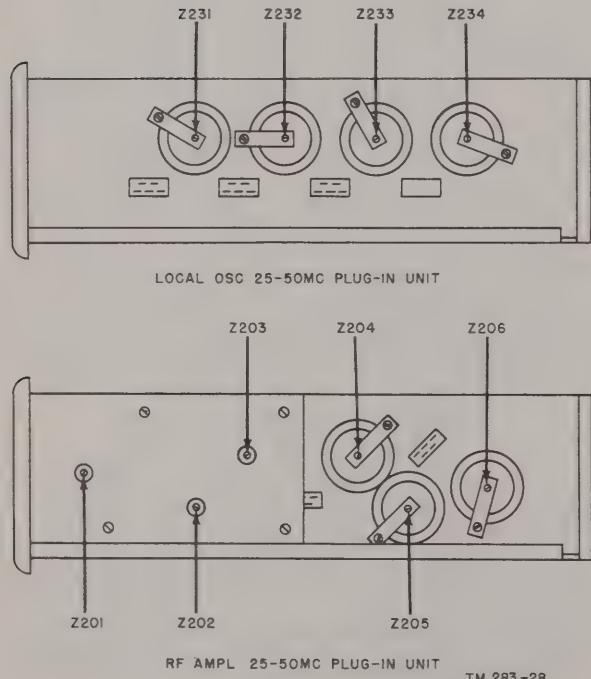


Figure 19. Radio Receiver R-257/U, frequency-changing alinement points.

Vtvm connection	Adjustment	Indication
None.	Z231 unscrewed almost all the way counter-clockwise.	None.
R231 at terminal on TB231 and GND test points.	Z231.	Maximum negative voltage.
R239 at terminal on TB231 and GND test points.	Z232.	Maximum negative voltage.
LO and GND test points.	Z233 and Z234.	Maximum negative voltage.

c. R-f and First Mixer Alinement Procedure. R-f stages V201 and V202, and mixer stage V203 must be alined to the new signal frequency. A vtvm is used at the receiver 2ND IF and GND test points on the front panel for the tuning indications. The signal to which the stages are tuned is unmodulated and is provided by Signal Generator Set AN/URM-27 (TM 11-5522). Connect

the signal generator to the antenna coaxial connector and set it to the desired receiver frequency. Then make the following adjustments:

Vtvm connection	Adjustment	Indication
2ND IF and GND test points.	Z201, Z202, Z203, Z204, Z205, and Z206 in sequence.	Maximum negative voltage.
2ND IF and GND test points.	Repeat adjustments at least 3 times in sequence.	Maximum negative voltage.

Note. Keep the signal generator output as low as possible but high enough to maintain a good meter indication (near center of scale) on the lowest practicable range of the vtvm.

d. Adjusting Receiver to Transmitter Frequency. It usually is not possible to aline the receiver exactly to the distant transmitter frequency by

the use of a signal generator. A slight adjustment of the h-f crystal oscillator is necessary for precise alinement. The procedure is as follows:

- (1) Place the receiver in operation as described in paragraphs 23, 24, and 25. Make sure that the transmitter is operating on the desired signal frequency. The radio set must be connected to an antenna for this adjustment.
- (2) Connect a vtvm to the front panel test points marked DISCR and GND.
- (3) Adjust oscillator warping coil Z231 for a +1-volt reading on the vtvm.
- (4) The receiver now is alined to the desired operating frequency. Slide the covers on the plug-in units and insert the plug-in units in the receiver base assembly. Disconnect the patch cord (CX-2371/U) and replace the receiver in the cabinet.

Section III. OPERATION UNDER UNUSUAL CONDITIONS

28. General

The operation of Radio Receiving Set AN/FRR-44 may be difficult in regions where extreme cold, heat, humidity and moisture, sand conditions, etc., prevail. In the following paragraphs, instructions are given for minimizing the effects of these unusual operating conditions.

29. Operation in Arctic Climates

Subzero temperatures and climatic conditions associated with cold weather affect the efficient operation of the equipment. Instructions and precautions for operation under such adverse conditions follow:

- a. Handle the equipment carefully.*
- b. Keep the equipment warm and dry if possible. If the receiving set is not in a heated room or inclosure, construct an insulated box for the receiver. An illuminated electric light bulb placed in the insulated box will keep the receiving set warm when it is not in operation.*
- c. After the radio set has been exposed to the cold it will sweat and continue to do so until it reaches room temperature. Wipe the moisture off the radio set, and remove Radio Receiver R-*

257/U from Electrical Equipment Cabinet CY-1150/U and continue the inspection for moisture.

30. Operation in Tropical Climates

When operated in tropical climates, radio equipment may be installed in tents, huts, or, when necessary, in underground dugouts. When equipment is installed below ground, and when it is set up in swampy areas, moisture conditions are more acute than normal in the tropics. Ventilation is usually very poor, and the high relative humidity causes condensation of moisture on the equipment whenever the temperature of the equipment becomes lower than the surrounding air. To minimize this condition, place lighted electric bulbs near the equipment. Wipe off moisture when it is necessary to do so.

31. Operation in Desert Climates

a. Conditions similar to those encountered in tropical climates often prevail in desert areas. Use the same measures to insure proper operation of the equipment.

b. The main problem that arises with equipment operation in desert areas is the large amount of sand, dust, or dirt which enters the moving

parts of radio equipment, such as motors and power units. The ideal preventive precaution is to house the equipment in a dustproof shelter. However, since such a building is seldom available and would require air conditioning, the next best precaution is to make the building in which the equipment is located as dustproof as possible with available materials. Hang wet sacking over the windows and doors, cover the inside walls with heavy paper, and secure the side walls of the tent with sand to prevent flapping in the wind.

c. Never tie power cords, signal cords, or other wiring connections to either the inside or the outside of tents. Desert areas are subject to sudden wind squalls that may jerk the connections loose or break the lines.

d. Be careful to keep the equipment as free from dust as possible. Make frequent preventive maintenance checks (ch. 3). Note the condition of the lubrication of the equipment. Excessive amounts of dust, sand, or dirt that come into contact with oil and grease result in grit, which will damage the equipment.

CHAPTER 3

ORGANIZATIONAL MAINTENANCE INSTRUCTIONS

Section I. PREVENTIVE MAINTENANCE SERVICES

32. Special Tools

A white plastic alinement tool is supplied with the radio set. It is used for adjusting the tuned circuits in Radio Receiver R-257/U. One end of this alinement tool is hollow, with a slotted metal insert that engages the tuned-circuit adjusting screws. The other end of the tool is shaped like a conventional screwdriver blade. This alinement tool is fastened inside the rear cover of Electrical Equipment Cabinet CY-1150/U with two fuse-type clips (fig. 4).

33. Definition of Preventive Maintenance

Preventive maintenance is work performed on equipment (usually when the equipment is not in use) to keep it in good working order so that break-downs and needless interruptions in service will be kept to a minimum. Preventive maintenance differs from trouble shooting and repair since its object is to prevent certain troubles from occurring. Refer to AR 750-5.

34. General Preventive Maintenance Techniques

a. Use #0000 sandpaper to remove corrosion. Never use steel wool.

b. Use a clean, dry, lint-free cloth or a dry brush for cleaning.

- (1) If necessary, except for electrical contacts, moisten the cloth or brush with Solvent, Dry Cleaning (SD); then wipe the parts dry with a cloth.
- (2) Clean electrical contacts with a cloth moistened with carbon tetrachloride; then wipe them dry with a cloth.

Caution: Repeated contact of carbon tetrachloride with the skin or prolonged

breathing of the fumes is dangerous. Make sure adequate ventilation is provided.

c. If available, dry compressed air may be used at a line pressure not exceeding 60 psi (pounds per square inch) to remove dust from inaccessible places. Be careful, however, or mechanical damage from the air blast may result.

d. For further information on preventive maintenance techniques, refer to TB SIG 178.

35. Use of Preventive Maintenance Forms (figs. 20 and 21)

a. The decision as to which items on DA AGO Forms 11-238 and 11-239 are applicable to this equipment is to be made in the case of first echelon maintenance by the communication officer/chief or his designated representative, and in the case of second and third echelon maintenance, by the individual making the inspection. Instructions for the use of each form appear on the reverse side of the form.

b. Circled items in figures 20 and 21 are partially or totally applicable to Radio Receiving Set AN/FRR-44. References in the ITEM block refer to paragraphs in the text which contain additional maintenance information.

36. Performing Exterior Preventive Maintenance

Caution: Tighten screws, bolts, and nuts carefully. Fittings tightened beyond the pressure for which they are designed will become damaged or broken.

a. Check for completeness of the radio set (receiver, power supply, cabinet, antenna, cables, wires, and instruction books) (par. 8).

OPERATOR FIRST ECHELON MAINTENANCE CHECK LIST FOR SIGNAL CORPS EQUIPMENT
RADIO COMMUNICATION, DIRECTION FINDING, CARRIER, RADAR

INSTRUCTIONS: See other side

EQUIPMENT NOMENCLATURE

RADIO RECEIVING SET AN/FRR-44

EQUIPMENT SERIAL NO.

LEGEND FOR MARKING CONDITIONS: Satisfactory; Adjustment, repair or replacement required; Defect corrected.

NOTE: Strike out items not applicable.

DAILY

NO.	ITEM	1 CON- DIT- ION NO.	CONDITION					
			S	M	T	W	T	F
1	COMPLETENESS AND GENERAL CONDITION OF EQUIPMENT (receiver, transmitter, carrying cases, wire and cable, microphones, tubes, spare parts, technical manuals and accessories).	PAR. 8						
2	LOCATION AND INSTALLATION SUITABLE FOR NORMAL OPERATION.	PAR. 17						
3	CLEAN DIRT AND MOISTURE FROM ANTENNA, MICROPHONE, HEADSETS, CHESTSETS, KEYS, JACKS, PLUGS, TELEPHONES, CARRYING BAGS, COMPONENT PANELS.	PAR. 37c						
4	INSPECT SEATING OF READILY ACCESSIBLE "PLUCK-OUT" ITEMS: TUBES, LAMPS, CRYSTALS, FUSES, CONNECTORS, VIBRATORS, PLUG-IN COILS AND RESISTORS.	PAR. 37d						
5	INSPECT CONTROLS FOR BINDING, SCRAPING, EXCESSIVE LOOSENESS, WORN OR CHIPPED GEARS, MISALIGNMENT, POSITIVE ACTION.	PAR. 37e						
6	CHECK FOR NORMAL OPERATION.	PAR. 37f						

WEEKLY

NO.	ITEM	1 CON- DIT- ION NO.	CONDITION					
			S	M	T	W	T	F
7	CLEAN AND TIGHTEN EXTERIOR OF COMPONENTS AND CASES, RACK MOUNTS, SHOCK MOUNTS, ANTENNA MOUNTS, COAXIAL TRANSMISSION LINES, WAVE GUIDES, AND CABLE CONNECTIONS.	PAR. 37g	13					
8	INSPECT CASES, MOUNTINGS, ANTENNAS, TOWERS, AND EXPOSED METAL SURFACES, FOR RUST, CORROSION, AND MOISTURE.	PAR. 37h	14					
9	INSPECT CORD, CABLE, WIRE, AND SHOCK MOUNTS FOR CUTS, BREAKS, FRAYING, DETERIORATION, KINKS, AND STRAIN.	PAR. 37i	15					
10	INSPECT ANTENNA FOR ECCENTRICITIES, CORROSION, LOOSE FIT, DAMAGED INSULATORS AND REFLECTORS.	PAR. 37j	16					
11	INSPECT CANVAS ITEMS, LEATHER, AND CABLING FOR MILDEW, TEARS, AND FRAYING.	PAR. 37k	17					
12	INSPECT FOR LOOSENESS OF ACCESSIBLE ITEMS: SWITCHES, KNOBS, JACKS, CONNECTORS, ELECTRICAL TRANSFORMERS, POWER-STATS, RELAYS, SELSYSNS, MOTORS, BLOWERS, CAPACITORS, GENERATORS, AND PILOT LIGHT ASSEMBLIES.	PAR. 37l	18					

19 IF DEFICIENCIES NOTED ARE NOT CORRECTED DURING INSPECTION, INDICATE ACTION TAKEN FOR CORRECTION.

DA AGO FORM 11-238

1 MAY 51 REPLACES DA AGO FORM 419, 1 DEC 50, WHICH IS OBSOLETE.

TM 225-20

Figure 20. DA AGO Form 11-238.

SECOND AND THIRD ECHELON MAINTENANCE CHECK LIST FOR SIGNAL CORPS EQUIPMENT RADIO COMMUNICATION, DIRECTION FINDING, CARRIER, RADAR			
INSTRUCTIONS: See other side			
EQUIPMENT NOMENCLATURE RADIO RECEIVING SET AN/FRR-44		EQUIPMENT SERIAL NO.	
LEGEND FOR MARKING CONDITIONS: ✓ Satisfactory; I Adjustment, repair or replacement required; (D) Defect corrected. NOTE: Strike out items not applicable.			
NO.	ITEM	COND.	ITEM
1	COMPLETENESS AND GENERAL CONDITION OF EQUIPMENT (receiver, transmitter, carrying cases, wire and cables, microphones, tubes, spare parts, technical manuals and accessories). PAR. 8	19	ELECTRON TUBES - INSPECT FOR LOOSE ENVELOPES, CAP CONNECTORS, CRACKED SOCKETS; INSUFFICIENT SOCKET SPRING TENSION; CLEAN DUST AND DIRT CAREFULLY; CHECK EMISSION OF RECEIVER TYPE TUBES.
2	LOCATION AND INSTALLATION SUITABLE FOR NORMAL OPERATION. PAR. 17	20	INSPECT FILM CUT-OUTS FOR LOOSE PARTS, DIRT, MISALIGNMENT AND CORROSION.
3	CLEAN DIRT AND MOISTURE FROM ANTENNA, MICROPHONE, HEADSETS, CHESTSETS, KEYS, JACKS, PLUGS, TELEPHONES, CARRYING BAGS, COMPONENT PANELS. PAR. 37c	21	INSPECT FIXED CAPACITORS FOR LEAKS, BULGES, AND DISCOLORATION.
4	INSPECT SEATING OF READILY ACCESSIBLE "PLUCK-OUT" ITEMS: TUBES, LAMPS, CRYSTALS, FUSES, CONNECTORS, VIBRATORS, PLUG-IN COILS AND RESISTORS. PAR. 37d	22	INSPECT RELAY AND CIRCUIT BREAKER ASSEMBLIES FOR LOOSE MOUNTINGS; BURNED, PITTED, CORRODED CONTACTS; MISALIGNMENT OF CONTACTS AND SPRINGS; INSUFFICIENT SPRING TENSION; BINDING OF PLUNGERS AND HINGE PARTS.
5	INSPECT CONTROLS FOR BINDING, SCRAPING, EXCESSIVE LOOSENESS, WORN OR CHIPPED GEARS, MISALIGNMENT, POSITIVE ACTION. PAR. 37e	23	INSPECT VARIABLE CAPACITORS FOR DIRT, MOISTURE, MISALIGNMENT OF PLATES, AND LOOSE MOUNTINGS.
6	CHECK FOR NORMAL OPERATION. PAR. 37f	24	INSPECT RESISTORS, BUSHINGS, AND INSULATORS, FOR CRACKS, CHIPPING, BLISTERING, DISCOLORATION AND MOISTURE. PAR. 38a
7	CLEAN AND TIGHTEN EXTERIOR OF COMPONENTS AND CASES, RACK MOUNTS, SHOCK MOUNTS, ANTENNA MOUNTS, COAXIAL TRANSMISSION LINES, WAVE GUIDES, AND CABLE CONNECTIONS. PAR. 37g	25	INSPECT TERMINALS OF LARGE FIXED CAPACITORS AND RESISTORS FOR CORROSION, DIRT AND LOOSE CONTACTS.
8	INSPECT CASES, MOUNTINGS, ANTENNAS, TOWERS, AND EXPOSED METAL SURFACES, FOR RUST, CORROSION, AND MOISTURE. PAR. 37h	26	CLEAN AND TIGHTEN SWITCHES, TERMINAL BLOCKS, BLOWERS, RELAY CASES, AND INTERIORS OF CHASSIS AND CABINETS NOT READILY ACCESSIBLE. PAR. 38b
9	INSPECT CORD, CABLE, WIRE, AND SHOCK MOUNTS FOR CUTS, BREAKS, FRAYING, DETERIORATION, KINKS, AND STRAIN. PAR. 37i	27	INSPECT TERMINAL BLOCKS FOR LOOSE CONNECTIONS, CRACKS AND BREAKS. PAR. 38c
10	INSPECT ANTENNA FOR ECCENTRICITIES, CORROSION, LOOSE FIT, DAMAGED INSULATORS AND REFLECTORS. PAR. 37j	28	CHECK SETTINGS OF ADJUSTABLE RELAYS.
11	INSPECT CANVAS ITEMS, LEATHER, AND CABLING FOR MILDEW, TEARS, AND FRAYING.	29	LUBRICATE EQUIPMENT IN ACCORDANCE WITH APPLICABLE DEPARTMENT OF THE ARMY LUBRICATION ORDER.
12	INSPECT FOR LOOSENESS OF ACCESSIBLE ITEMS: SWITCHES, KNOBS, JACKS, CONNECTORS, ELECTRICAL TRANSFORMERS, POWERSTATS, RELAYS, SELSYNS, MOTORS, BLOWERS, CAPACITORS, GENERATORS, AND PILOT LIGHT ASSEMBLIES. PAR. 37k	30	INSPECT GENERATORS, AMPLIDYNES, DYNAMOTORS, FOR BRUSH WEAR, SPRING TENSION, ARCING, AND FITTING OF COMMUTATOR.
13	INSPECT STORAGE BATTERIES FOR DIRT, LOOSE TERMINALS, ELECTROLYTE LEVEL AND SPECIFIC GRAVITY, AND DAMAGED CASES.	31	CLEAN AND TIGHTEN CONNECTIONS AND MOUNTINGS FOR TRANSFORMERS, CHOKES, POTENTIOMETERS, AND RHEOSTATS. PAR. 38d
14	CLEAN AIR FILTERS, BRASS NAME PLATES, DIAL AND METER WINDOWS, JEWEL ASSEMBLIES. PAR. 37l	32	INSPECT TRANSFORMERS, CHOKES, POTENTIOMETERS, AND RHEOSTATS FOR OVERHEATING AND OIL-LEAKAGE. PAR. 38e
15	INSPECT METERS FOR DAMAGED GLASS AND CASES.	33	BEFORE SHIPPING OR STORING - REMOVE BATTERIES.
16	INSPECT SHELTERS AND COVERS FOR ADEQUACY OF WEATHERPROOFING. PAR. 37m	34	INSPECT CATHODE RAY TUBES FOR BURNT SCREEN SPOTS.
17	CHECK ANTENNA GUY WIRES FOR LOOSENESS AND PROPER TENSION. PAR. 37n	35	INSPECT BATTERIES FOR SHORTS AND DEAD CELLS.
18	CHECK TERMINAL BOX COVERS FOR CRACKS, LEAKS, DAMAGED GASKETS, DIRT AND GREASE. PAR. 37o	36	INSPECT FOR LEAKING WATERPROOF GASKETS, WORN OR LOOSE PARTS. PAR. 38f
38	IF DEFICIENCIES NOTED ARE NOT CORRECTED DURING INSPECTION, INDICATE ACTION TAKEN FOR CORRECTION.	37	MOISTURE AND FUNGI-PROOF. PAR. 38g

DA AGO FORM 1 MAY 51 11-239

REPLACES DA AGO FORM 419, 1 DEC 50, WHICH IS OBSOLETE.

60-10-64382-1

TM 225-21

Figure 21. DA AGO Form 11-239.

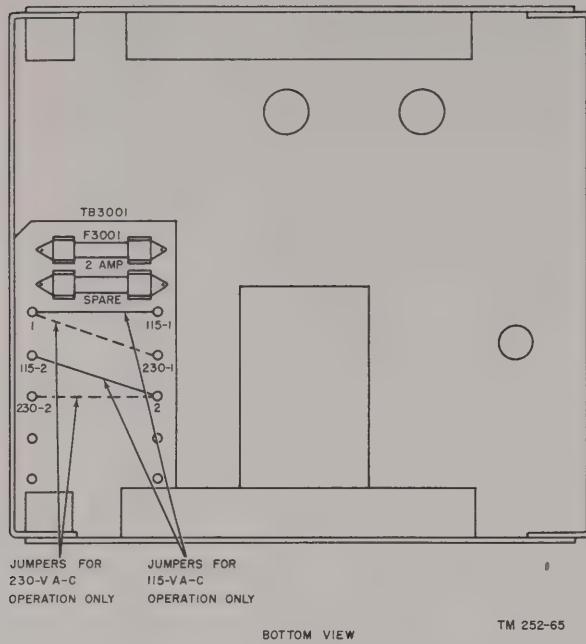


Figure 22. Power Supply PP-846/U, fuse location

- b. Check the radio set for suitable location and installation (par. 17).
- c. Remove dirt and moisture from antenna, jacks, plugs, and component panels.
- d. Inspect seating of readily accessible pluck-out items such as connectors, fuses (fig. 22), and the receiver.
- e. Inspect VOLUME and SQUELCH controls for binding, scraping, excessive looseness, and positive action.
- f. Check for normal operation (pars. 23 through 26).
- g. Clean and tighten exterior of components, Electrical Equipment Cabinet CY-1150/U, and cable connections.
- h. Inspect mountings, antenna, and exposed metal surfaces for rust, corrosion, and moisture.

Section II. WEATHERPROOFING

38. Weatherproofing

- a. *General.* Signal Corps equipment, when operated under severe conditions such as prevail in tropical, arctic, and desert regions, requires spe-

i. Inspect cords, cables, wires, and shock mounts for cuts, breaks, fraying, deterioration, kinks, and strain.

j. Inspect antenna for eccentricities, corrosion, loose fit, and damaged insulators.

k. Inspect for looseness of accessible items: switches, knobs, connectors, and pilot light.

l. Clean nameplates and jewel assembly.

m. Inspect shelter or cover for adequacy of weatherproofing.

n. Inspect antenna guy wires for looseness and proper tension.

o. Inspect cabinet covers for cracks, leaks, damaged gaskets, and dirt.

37. Performing Interior Preventive Maintenance

Caution: Disconnect all power before performing the following operations. Upon completion, reconnect power and check for satisfactory operation (pars. 23 through 26).

- a. Inspect resistors, bushings, and insulators for cracks, chipping, blistering, discoloration, and moisture.
- b. Clean and tighten switches, terminal boards, and interior of cabinet.
- c. Inspect terminal boards for loose connections, cracks, and breaks.
- d. Clean and tighten connections and mountings for potentiometers.
- e. Check potentiometers for overheating.
- f. Inspect for damaged waterproof gaskets and worn or loose parts.
- g. Check for adequacy of moistureproofing and fungiproofing.
- h. Check the exterior and interior preventive maintenance items for Radio Receiver R-257/U and Power Supply PP-846/U.

cial treatment and maintenance. Fungus growth, insects, dust, corrosion, salt spray, excessive moisture, and extreme temperatures are harmful to most materials.

b. Tropical Maintenance. A special moisture-proofing and fungiproofing treatment has been devised which, if properly applied, provides a reasonable degree of protection. This treatment is explained fully in TB SIG 13 and TB SIG 72.

c. Winter Maintenance. Special precautions necessary to prevent poor performance or total operational failure of equipment in extremely low temperatures are explained fully in TB SIG 66 and TB SIG 219.

d. Desert Maintenance. Special precautions necessary to prevent equipment failure in areas subject to extremely high temperatures, low humidity, and excessive sand and dust are explained fully in TB SIG 75.

e. Lubrication. The effects of extreme cold and heat on materials and lubricants are explained in TB SIG 69. Observe all precautions outlined in TB SIG 69 and pay strict attention to all lubrication orders when operating equipment under conditions of extreme cold or heat.

39. Rustproofing and Painting

a. When the finish on the cabinet has been badly scarred or damaged, rust and corrosion can be prevented by touching up bared surfaces. Use #00 or #000 sandpaper to clean the surface down to the bare metal; obtain a bright smooth finish.

Caution: Do not use steel wool. Minute particles frequently enter the cabinet and cause harmful internal shorting or grounding of circuits.

b. When a touch-up job is necessary, apply paint with a small brush. Remove rust from the cabinet by cleaning corroded metal with solvent (SD). In severe cases, it may be necessary to use solvent (SD) to soften the rust and to use sandpaper to complete the preparation for painting. Paint used will be authorized and consistent with existing regulations. Refer to TM 9-2851.

Section III. TROUBLE SHOOTING AT ORGANIZATIONAL MAINTENANCE LEVEL

40. Scope

a. The trouble shooting and repair work that can be performed at the organizational maintenance level (operators and repairmen) is necessarily limited in scope by the tools, test equipment, replaceable parts issued, and by the existing tactical situation. Accordingly, trouble shooting is based on the performance of the equipment and the use of the senses in determining such troubles as burned-out tubes, cracked insulators, etc.

b. The paragraphs which follow in this section will help to determine which component is at fault, and will aid in localizing the fault in that component to the defective stage or item, such as a tube or fuse.

41. Visual Inspection

a. Failure of this radio set to operate properly may be traced to one or more of the following faults:

- (1) Worn, broken, or disconnected cables.
- (2) Burned-out fuses on Power Supply PP-846/U (fig. 22).

(3) Defective tubes or crystals (refer to Radio Receiver R-257/U instruction book).

b. Sometimes the cause of the failure is not apparent; therefore, the above items should be checked before making a more detailed inspection of the component parts. If possible, obtain information from the operator of the radio set regarding performance at the time trouble occurred, such as signs of overheating, smoking, arcing, or peculiar noises associated with the failure.

42. System Sectionalization of Trouble to a Component

System sectionalization of Radio Receiving Set AN/FRR-44 consists of determining whether the trouble is in the receiver, power supply, cabinet, antenna, or in the power source.

a. Operate the radio receiving set and observe its performance. Refer to the equipment performance checklist (par. 44) for normal indications.

b. If another receiver, power supply, or antenna is available, substitute it for the original component. This test should indicate the defective component.

c. Check the connectors between the various components. The trouble may be in one of the cabinet connectors.

d. If the defective component is the receiver or the power supply, refer to the instruction book for that component for further trouble-shooting information.

43. Trouble Shooting by Using Equipment Performance Checklist

a. *General.* The equipment performance checklist (par. 44) will help the operator to locate trouble in the equipment. The list gives the item to be checked, the conditions under which the item is checked, the normal indications and tolerances of correct operation, and the corrective measures the operator can take. *Follow the items in numerical sequence.*

b. *Action or Condition.* For some items, the information given in the *Action or condition* col-

umn consists of various switch and control settings under which the item is to be checked. For other items, it represents an action that must be taken to check the normal indication given in the *Normal indications* column.

c. *Normal Indications.* The normal indications listed include the visible and audible signs that the operator should perceive when he checks the items. If the indications are not normal, the operator should apply the recommended corrective measures.

d. *Corrective Measures.* The corrective measures listed are those the operator can make without turning in the equipment for repairs. If the corrective measures do not yield results, higher echelon maintenance is necessary. However, if the tactical situation requires that communication be maintained, and if the set is not completely inoperative, the operator must maintain the set in operation as long as it is possible to do so.

44. Equipment Performance Checklist

	Item No.	Item	Action or condition	Normal indications	Corrective measures
P R E P A R A T O R Y	1	Antenna AS-612/U.	Coaxial cable connected to J2402.		
	2	Power source.	Power cable connected to terminals 4 and 5 on TB2401 for 115-volt a-c operation or to terminals 4 and 6 for 230-volt a-c operation.		
	3	SQUELCH control.	Set at OFF.		
	4	VOLUME control.	Set at OFF.		
	5	Receiver.	Properly connected in cabinet.		
S T A R T	6	VOLUME control.	Turn control clockwise 2 or 3 positions.	POWER indicator lamp lights; rushing noise or signal heard in receiver.	Check: power source, power cable, power supply connector P251, receiver connector P252, and VOLUME control S2401A; check receiver (refer to receiver instruction book).

		Item No.	Item	Action or condition	Normal indications	Corrective measures
E Q U I P M E N T		7	VOLUME control.	Turn control fully clockwise.	Signal or noise at maximum volume.	Check VOLUME control S2401A. Check receiver (refer to receiver instruction book).
P E R F O R M A N C E		8	SQUELCH control.	With no signal and only noise being received, turn control slowly counter-clockwise until noise stops. Turn control clockwise until rushing noise again appears.	Receiver quiets. Receiver is unsquelched.	Check SQUELCH control and connector J2401. Check receiver (refer to receiver instruction book). If the squelching action is erratic, SQUELCH control may be defective (refer to receiver instruction book).
S T O P		9	SQUELCH control.	Turn fully clockwise to OFF position.	Signal or noise continues.	
		10	VOLUME control.	Turn fully, counterclockwise to OFF position.	POWER indicator lamp goes out.	

CHAPTER 4

THEORY

45. Scope

a. This chapter will aid the repairman in understanding the operation of Radio Receiving Set AN/FRR-44. Trouble shooting, operation, and servicing will be performed more efficiently if the receiving set theory is understood. The repairman should study the theory information in this instruction book as well as the theory chapters in the instruction books for Radio Receiver R-257/U and Power Supply PP-846/U.

b. The theory in this instruction book is limited primarily to the control circuits in Electrical Equipment Cabinet CY-1150/U and their direct connection with circuits in Radio Receiver R-257/U and Power Supply PP-846/U.

46. Power Input Circuit

(fig. 32)

a. Power from a 115- or 230-volt a-c source is connected to terminal board TB2401 in Electrical Equipment Cabinet CY-1150/U. Switch S2401B opens the primary circuit when it is in the OFF position. This primary power is wired through jack J2401 in the cabinet, and mates with P252 in the receiver base. Receiver power supply connector P251 mates with connector J3001, which is located on the receiver base. Fuse F3001 protects the power supply from circuit overloads.

b. Power transformer T3001 has two primary windings. For 115-volt operation, wire jumpers are connected between the terminals on TB3001 marked 115-1 and 1 and 115-2 and 2. These jumpers connect the two primaries in parallel. For 230-volt operation, wire jumpers on TB3001 are connected between the terminals marked 230-1 and 1 and 230-2 and 2. These jumpers connect the primary windings in series.

c. A source of 6.3 volts a-c from a secondary winding of transformer T3001 (terminals 12 and

13) is wired through the intercomponent connectors to green indicator lamp I 2401 on the front panel of Electrical Equipment Cabinet CY-1150/U. Resistor R2407 reduces the lamp voltage, thereby prolonging the life of the lamp. Terminal board TB251 is located on the receiver base.

d. The three power input circuits shown enclosed in broken lines are the d-c power input circuits for the 6-, 12-, and 24-volt receiver power supplies. The circuits are similar to the a-c power supply input circuit except that the battery voltage is connected to the power supply on a different set of terminals in each case. This is done to prevent application of incorrect power to the vibrators and power transformers in the d-c power supplies. Fuses F2701, F2801, and F2901 protect their respective power supplies from circuit overloads.

47. B+ Supply Circuits

(fig. 32)

The +145-volt supply is applied to most of the plate and screen grid circuits in Radio Receiver R-257/U through J3001(4) in Power Supply PP-846/U and P251(4) in the receiver base. The +150-volt supply is applied to the plate and screen grid of the squelch clamp tube (V125) in the receiver, and to the screen grid of the audio power-amplifier tube (V122) through J3001(5) and P251(5). The +160-volt supply is applied to the plate circuit of the audio power amplifier tube (V122) through connectors J3001(8) and P251(8). Figure 32 shows only the power connectors in the power supply and receiver. Refer to the schematic diagram of Radio Receiver R-257/U (fig. 29) for the complete circuits. Refer to the receiver instruction book for the B+ distribution schematic diagram.

48. Filament Supply Circuits

The two sources of filament and heater voltages, +1.4 volts d-c and 6.3 volts a-c, are shown in figure 32. The heater voltage required for crystal oven E231 in the LOCAL OSC 25-50 MC plug-in unit also is shown. The +1.4-volt supply is connected from its source in Power Supply PP-846/U to the receiver at J3001(13) and P251(13), respectively. The source of 6.3 volts a-c for the heaters of tubes V201 and V122 is connected from the power supply to the receiver through J3001(2) and P251(2), respectively. The crystal oven heater in the receiver also is connected to this 6.3-volt a-c source through J3001(9) and P251(9). These circuits can be examined more thoroughly by referring to the schematic diagram of Radio Receiver R-257/U (fig. 29).

49. Antenna Input Circuit

The antenna used with Radio Receiving Set AN/FRR-44 is connected to feedthrough coaxial connector J2402. This connector is located on the rear cover of the cabinet. Plug P2401 mates with J2402 and feeds the antenna signal to J2401(A2) through a length of coaxial cable. Connector J2401 mates with the main receiver connector P252. Another length of coaxial cable in the receiver base feeds the signal to J251. Plug P201 is in the RF AMPL 25-50 MC plug-in unit and mates with J251. The antenna cable is terminated at the junction of capacitors C202 and C203, which are part of tuned-circuit Z201. Connecting the antenna cable at this junction terminates the antenna transmission line in approximately 52 ohms.

50. Audio Output Circuit

(fig. 32)

a. Audio power is taken from the 8-ohm secondary of the audio output transformer T121; it then is fed through plug P121 in the AUDIO & SQUELCH plug-in unit, and then through jack J262 in the receiver base to plug P252, the main receiver connector. This plug mates with jack J2401 in Electrical Equipment Cabinet CY-1150/U and feeds the audio output voltage to speaker LS2401 through VOLUME control switch S2401A.

b. When S2401A is in the extreme counterclockwise position (OFF), the circuit between the secondary of T121 and loudspeaker LS2401 is open. When the switch is moved one position clockwise, R2406 is connected across terminals 3 and 4 of

T121, and R2405 is connected in series with LS2401. R2405 drops the voltage applied to LS2401 and lowers the audio output of the loudspeaker. R2406 is in parallel with the series combination of R2405 and LS2401 to keep the load impedance presented to the secondary of T121 at 8 ohms. In the third and fourth clockwise positions, the resistance placed in series with LS2401 is progressively reduced. This allows increased audio output at the loudspeaker. In the fifth clockwise position, the loudspeaker is connected directly across the secondary of T121, and maximum audio output is obtained. In each case, the load impedance presented to the secondary of T121 is 8 ohms. This provides for optimum operation of the audio amplifier.

51. Squelch Circuit

a. The complete operation of the squelch circuit in Radio Receiver R-257/U requires the use of the SQUELCH control (R2408) and the squelch disable switch (S2402), both of which are located in Electrical Equipment Cabinet CY-1150/U.

b. System connections of the squelch circuit are shown in figure 32. The +145-volt supply is applied to the series connection of R252 in the receiver base and SQUELCH control R2408 through the intercomponent connectors. Adjusting the SQUELCH control varies the positive bias applied to the control grid of the noise amplifier tube (V123) in the AUDIO & SQUELCH plug-in unit in Radio Receiver R-257/U. Turning R2408 clockwise (sweeping arm moves toward ground) increases this positive bias, thereby making the squelch circuit less sensitive. Turning R2408 counterclockwise decreases the positive bias and makes the squelch circuits more sensitive. Resistors R131, R135, and R136, capacitor C130, and diode CR121 are discussed in the Radio Receiver R-257/U instruction book.

c. The +145-volt supply also is applied to series-connected resistors R142 through R145. The bottom end of this series resistor string is connected to the -40-volt supply in the receiver power supply. When the squelch tube is not conducting, the voltage fed to the grid circuits of the audio tubes (V121 and V122) from the junction of R144 and R145 is very close to zero. When tube V124 is conducting, however, a large voltage drop across resistor R142 lowers the voltage at this junction to a value of approximately -25 volts.

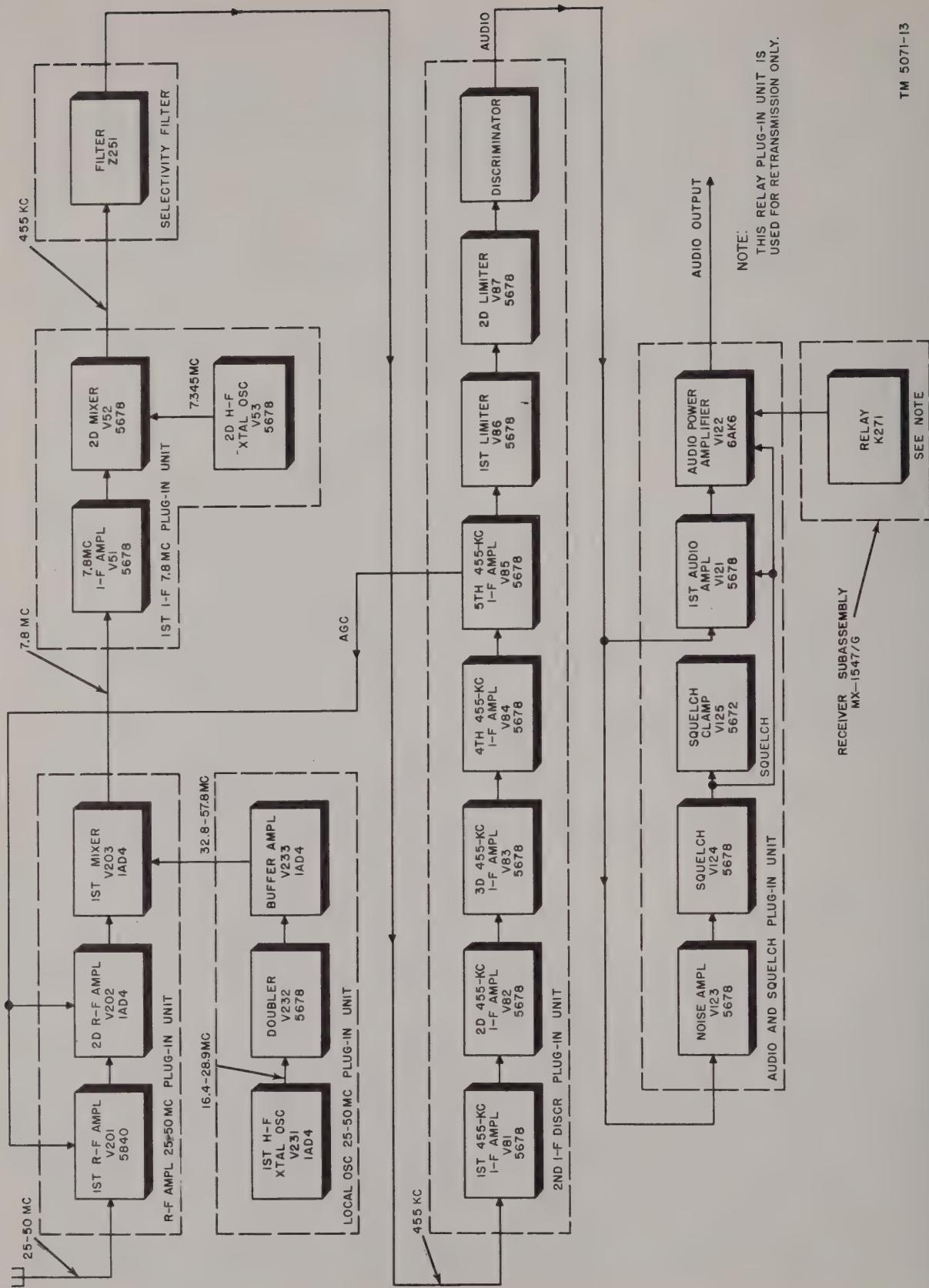


Figure 23. Radio Receiver R-257/U, block diagram.

This negative voltage applied through R128 biases the audio tubes (V121 and V122) beyond cutoff. R122 is the grid leak resistor for V121. R127 is a screwdriver adjusted audio volume control in the AUDIO & SQUELCH plug-in unit.

d. Switch S2402, the squelch disable switch, is ganged to R2408, and is closed when R2408 is turned fully clockwise. Closing switch S2402 places it in the OFF position. This keeps the bias of the audio amplifiers at zero and prevents the audio tubes from being squelched. Refer to the instruction book for Radio Receiver R-257/U for a complete explanation of the squelch circuit.

52. Relay Circuit

a. When a jumper is connected between terminals 9 and 10 of terminal board TB251, the cathode of tube V122 is connected to ground through the intercomponent connectors and R251. When the jumper is connected between terminals 10 and 11 of TB251 instead of between 9 and 10, relay K271 is used in place of R251 as the cathode-biasing resistance of V122. Relay K271, which pulls in when a current of 9 ma (milliamperes) flows through it, is operated when V122 is conducting.

b. The squelch circuit of Radio Receiver R-257/U silences the receiver by biasing the control grids of the audio stages beyond cutoff when no signal is being received. When V122 is cut off, K271 is de-energized. C271 and R271 partially bypass the coil of K271 to ground for audio frequencies, thus reducing cathode circuit degeneration.

c. Contacts 6, 7, and 8 of K271 are wired to terminal board TB2401 in Electrical Equipment Cabinet CY-1150/U through the plug-in unit and component connectors. Plug P271 is in the RELAY plug-in unit and mates with J263 which is connected directly to main receiver connector P252. Contacts 2 and 4 of relay K271 terminate at plug P252, but are not connected to TB2401 in the cabinet.

d. Contacts 6, 7, and 8 of K271 can be used for controlling an external circuit such as a call signal. When the receiver is squelched or inoperative, terminals 2 and 3 of TB2401 are connected electrically. When the receiver is operating and not squelched, terminals 1 and 2 of TB2401 are connected electrically.

53. Block Diagram of Radio Receiver

R-257/U

(fig. 23)

a. The signal path through Radio Receiver R-257/U is shown in figure 23. An f-m signal within the frequency band of 25 to 50 mc is amplified by first and second r-f amplifiers V201 and V202. This signal then is coupled to first mixer stage V203 where it beats with a signal from the plug-in unit marked LOCAL OSC 25-50 MC. The signal from this plug-in unit is obtained from third overtone crystal oscillator V231, frequency doubler stage V232, and buffer amplifier stage V233. The final frequency obtained is 7.8 mc above the r-f frequency at first mixer V203. Consequently, the first i-f frequency is 7.8 mc.

b. This 7.8-mc i-f signal is coupled to a third plug-in unit marked 1ST IF 7.8 MC. V51 amplifies the signal and couples it to second mixer stage V52. Second h-f oscillator stage V53 injects a 7.345-mc signal into the grid circuit of the second mixer, producing a second i-f frequency of 455 kc (kilocycles).

c. The output from the 1ST IF 7.8 MC plug-in unit is passed to a potted and permanently mounted selectivity filter (Z251), which is located in one of the receiver cells. This selectivity filter is resonant to the second i-f frequency of 455 kc with a band pass of ± 15 kc.

d. The fourth plug-in unit, marked 2ND IF DISCR, contains five 455-ke i-f amplifiers (V81 through V85) and two limiter stages (V86 and V87). Additional amplification of the signal is achieved by these five i-f amplifier stages, which are resistance-coupled except for the third 455-ke amplifier, which has a plate-tuned load. The two limiter stages remove amplitude variations from the signal that is fed to the discriminator stage. The discriminator stage of this plug-in unit uses two germanium crystal diodes that convert the f-m 455-ke i-f signal into an audio signal. A negative grid leak bias voltage, which is proportional to the signal strength of the incoming r-f signal, is developed at the control grid of the fifth 455-ke i-f amplifier (V85). A portion of this bias, referred to as agc (automatic gain control), is fed back to the control grids of the first and second r-f amplifiers (V201 and V202) in the RF AMPL 25-50 MC plug-in unit. This bias voltage reduces the gain of these two stages in proportion to the strength of the incoming signal. The agc

circuit tends to keep the output voltage of the fifth 455-kc amplifier constant despite changes in strength of the received signal.

e. The audio signal delivered by the discriminator of the previous plug-in unit is coupled to first audio amplifier V121 in a fifth plug-in unit marked AUDIO & SQUELCH. V121 and V122 amplify the audio signal to a power level sufficient to drive the loudspeaker.

f. The audio output from the discriminator in the 2ND IF DISCR plug-in unit also is fed to the squelch circuit, which is located in the AUDIO & SQUELCH plug-in unit. The audio signal is coupled through a high-pass network, allowing only the higher audio frequencies (which are essentially receiver noise) to reach the control grid of the noise amplifier stage (V123). This stage develops a negative bias when a noise signal is applied to it. The resulting rise in the d-c plate voltage of this tube is applied to the grid of squelch tube V124, causing the plate voltage of V124 to drop. The drop in plate voltage of V124 is applied to the grids of audio amplifiers V121 and V122 and biases these tubes beyond cutoff. Squelch clamp tube V125 reinforces the action of V124 to provide more positive action.

g. The sixth plug-in unit of the receiver is the RELAY unit. A relay within this unit pulls in when audio power-amplifier V122 is drawing plate current, and releases when the audio circuits of the receiver are squelched. The contacts of this relay are terminated at main receiver connector P252, and are used for operating call lights when desired. When Radio Receiver R-257/U is used in a radio set which contains a transmitter, the relay is used for retransmission.

54. Theory of Antenna AS-612/U

(fig. 9)

a. Antenna AS-612/U is a modified ground plane antenna designed for use in the r-f spectrum from 25 to 50 mc.

b. The ground plane type of antenna is light, rugged, nondirectional, and not critical in adjustment. It presents a balanced mechanical load to the supporting mast and has good frequency band coverage.

c. The true ground plane antenna, which consists of a vertical quarter-wave radiating whip and several horizontal nonradiating elements, is effective over a comparatively narrow band of frequencies and has an impedance of approximately 20 to 25 ohms. To broaden the band coverage and increase the impedance of the antenna to about 50 ohms, the horizontal elements are set at an angle of 142° from the vertical radiating element. As a result, all the elements effectively become radiating elements, the bandwidth of the antenna is increased, and the impedance is raised to the desired 50 ohms.

d. Over the frequency range of 25 to 50 mc, the antenna radiating elements must be varied in length (par. 17c).

e. The desired length of Cord CG-399A/U is 68 feet 3 inches. This length is critical and minimizes the standing wave ratio and reflections.

f. The antenna is nondirectional in the horizontal direction. Its vertical angle of radiation is very small and its gain is therefore greater than that of the conventional ground plane antenna.

CHAPTER 5

FIELD MAINTENANCE INSTRUCTIONS

Section I. TROUBLE SHOOTING AT FIELD MAINTENANCE LEVEL

55. General

This chapter contains information for field maintenance of Radio Receiving Set AN/FRR-44. The amount of repair that units having field maintenance responsibility can perform is limited only by the tools and test equipment available and by the skill of the repairman. This instruction book contains field maintenance instructions which pertain only to Electrical Equipment Cabinet CY-1150/U. Refer to the individual instruction book when trouble shooting Radio Receiver R-257/U or Power Supply PP-846/U. The information contained in this chapter also is valuable in initiating trouble shooting of the receiver and power supply.

56. Trouble-shooting Procedures

a. *General.* The first step in servicing a defective radio set is to sectionalize the fault. Sectionalization means tracing the fault to the *major component or circuit* responsible for the abnormal operation of the set. The second step is to localize the fault. Localization means tracing the fault to the defective *part* responsible for the abnormal condition. Some faults, such as burned-out resistors, arcing, and shorted transformers, often can be located by sight, smell, and hearing. The majority of faults in the receiver must be localized by *checking voltage and resistance*.

b. *Component Sectionalization.* System sectionalization is discussed in paragraph 42. Procedures for component sectionalization are described below:

- (1) *Visual inspection.* The purpose of visual inspection (par. 41) is to locate any visible trouble. Through this inspection, the repairman frequently may discover the trouble or determine the stage in

which the trouble exists. This inspection is valuable in avoiding additional damage to the set which may occur through improper repair methods and in fore-stalling future failures.

- (2) *Operational tests.* The operational test (par. 61) is important because it frequently indicates the general location of trouble. In many instances, the information gained will determine the exact nature of the fault. In order to utilize this information fully, all symptoms must be interpreted in relation to one another.
- (3) *Trouble-shooting chart.* The trouble symptoms listed in this chart (par. 62) will aid greatly in localizing trouble.
- (4) *Intermittents.* In all these tests, the possibility of intermittents should not be overlooked. If present, this type of trouble often may be made to appear by tapping or jarring the set.

57. Trouble-shooting Data

Take advantage of the material supplied in this instruction book. Consult the trouble-shooting data in the accompanying chart.

Par. or fig. No.	Description
Fig. 16	Radio Receiving Set AN/FRR-44, front panel terminal board.
Fig. 18	Radio Receiver R-257/U, test points.
Fig. 19	Radio Receiver R-257/U, frequency-changing alignment points.
Fig. 26	Radio Receiving Set AN/FRR-44, front cover removed, showing replaceable parts.

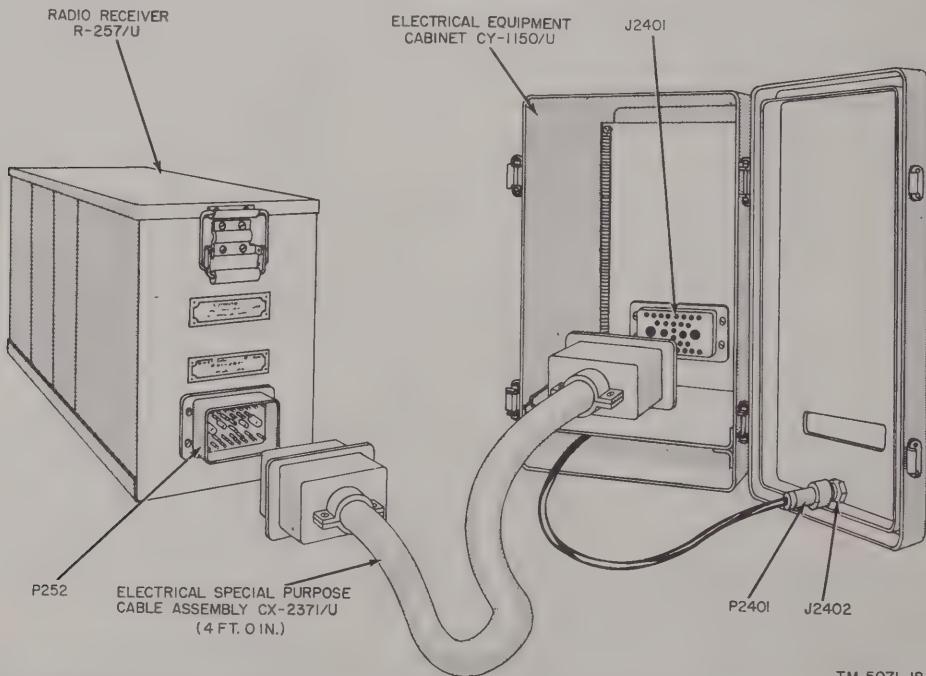


TM 839-12

Figure 24. Electrical Special Purpose Cable Assembly CX-2371/U.

57. Trouble-shooting Data (contd)

Par. or fig. No.	Description	Par. or fig. No.	Description
Fig. 29	Radio Receiver R-257/U, schematic diagram.	Par. 44	Equipment Performance Checklist.
Fig. 30	Electrical Equipment Cabinet CY-1150/U, schematic diagram.	Par. 61	Operational Test.
Fig. 31	Power Supply PP-846/U, schematic diagram.	Par. 62	Trouble-shooting Chart.
Fig. 32	Radio Receiving Set AN/FRR-44, control circuits.		Instruction book for Radio Receiver R-257/U.
			Instruction book for Power Supply PP-846/U.



TM 5071-18

Figure 25. Patch cord connection between Radio Receiver R-257/U and Electrical Equipment Cabinet CY-1150/U.

58. Test Equipment Required for Trouble Shooting

Electronic Multimeter TS-505/U (TM 11-5511), or equivalent, is useful when trouble shooting Radio Receiving Set AN/FRR-44. The use of this equipment for voltage or resistance measurements will be restricted to qualified personnel.

59. Use of Electrical Special Purpose Cable Assembly CX-2371/U (figs. 24 and 25)

This patch cord is available for connecting Radio Receiver R-257/U to Electrical Equipment Cabinet CY-1150/U when it is desired to operate the receiver out of the cabinet. This feature enables the repairman to trouble-shoot or align the receiver when such action is required. The patch cord is connected between J2401 in the cabinet and P252 in the receiver. (The patch cord will be listed in SIG 7 & 8-AN/FRR-44, when published, and can be requisitioned through normal supply channels.)

60. General Precautions

When servicing the radio receiving set, observe the following precautions:

- a. Do not make any repairs or adjustments inside the cabinet without first removing power from the set. Terminal board TB2401 carries 115 volts or 230 volts a-c.
- b. Be careful not to damage wires and cables if it is necessary to move or disconnect them from the terminal board or from one of the controls on the front cover.

c. When performing any soldering on the radio set, be sure to make well-soldered joints. Clean up any solder which may accidentally fall into the cabinet. A poor soldering job often leads to future troubles.

61. Operational Test

Turn the VOLUME control clockwise two or three positions. The POWER indicator lamp should light. Allow the tubes in Radio Receiver R-257/U approximately 20 or 30 seconds to warm up. If a signal is being transmitted on the receiver frequency, it should be audible. In the absence of a signal, a rushing noise should be heard. Turn the VOLUME control to each of the four volume levels while observing the relative volume. Set it for a comfortable volume level. If no signal is being received, turn the SQUELCH control counterclockwise slowly until the rushing noise stops. The receiver is now squelched. Turn the SQUELCH control clockwise. The rushing noise should once again appear. Turn the SQUELCH control fully clockwise to the OFF position. Turn the VOLUME control fully counterclockwise to the OFF position. The receiving set will be shut off and the POWER indicator will extinguish.

62. Trouble-shooting Chart

The following chart is supplied as an aid in locating trouble in the radio set. This chart lists symptoms, probable troubles, and corrections. In cases where the probable trouble exists in Radio Receiver R-257/U or Power Supply PP-846/U, reference is made to the component instruction book.

Symptom	Probable trouble	Correction
1. Radio set completely dead, and indicator lamp on radio set does not light.	1. Power cord not connected to TB2401. Defective fuse F3001 in receiver power supply. Switch S2401 defective. Defective terminals 4, 5, and 6 of TB2401 or terminals 3, 4, and 5 of P252. Defective Radio Receiver R-257/U. Defective power supply.	1. Connect to TB2401. Replace fuse (fig. 22). Replace switch. Check with ohmmeter; replace or repair terminal board or connector if necessary. Refer to receiver instruction book. Refer to power supply instruction book.

62. Trouble-shooting Chart (contd)

Symptom	Probable trouble	Correction
2. Receiver operates, but signals are very weak.	2. Defective antenna or antenna connections. Defective receiver.	2. Repair or replace antenna or connections. Refer to receiver instruction book.
3. Audio signal from loudspeaker distorted on all positions of VOLUME control.	3. Defective loudspeaker LS2401. Defective speaker connections through VOLUME control or at terminals 14 and 15 of J2401. Defective Radio Receiver R-257/U.	3. Replace LS2401. Repair or replace connections or connector. Refer to receiver instruction book.
4. Receiving set will not squelch.	4. SQUELCH control S2402 or squelch disable switch defective. Trouble in receiver.	4. Replace S2402. Refer to receiver instruction book.
5. Receiving set operates, but POWER indicator lamp will not light.	Lamp I2401 or resistor R2407 defective.	Replace I2401 or R2407.
6. Hum or noise in radio set audio signal.	6. Defective receiver. Defective power supply.	6. Refer to receiver instruction book. Refer to power supply instruction book.
7. If the RELAY plug-in unit in Radio Receiver R-257/U is used, it does not operate. Reception is normal.	7. Defective RELAY plug-in unit.	7. Refer to receiver instruction book.

Section II. REPAIRS

63. Replacement of Parts

(fig. 26)

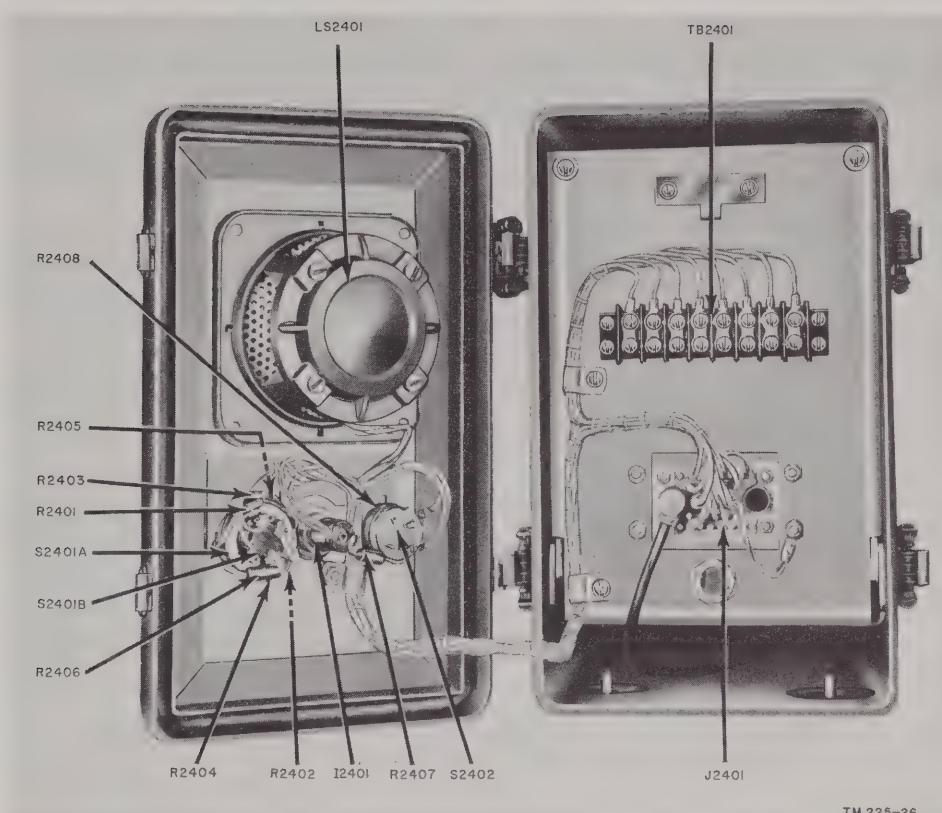
a. There are few parts to be disassembled in Radio Receiving Set AN/FRR-44. Most of the parts that require replacement are fastened with threaded fasteners.

b. Radio Receiver R-257/U is removed by opening the rear cover and turning the lock-in

handle counterlockwise. The receiver then is withdrawn by pulling it out of the cabinet. The handle on the receiver provides a firm hold on the receiver.

64. Refinishing

Badly marred cabinets may be refinishing by following the instructions given in paragraph 39 and in TM 9-2851.



TM 225-26

Figure 26. Radio Receiving Set AN/FRR-44, front cover removed, showing replaceable parts.

CHAPTER 6

SHIPMENT AND LIMITED STORAGE AND DEMOLITION TO PREVENT ENEMY USE

Section I. SHIPMENT AND LIMITED STORAGE

65. Disassembly

The following instructions are furnished as a guide for preparing the radio set for transportation and storage.

- a. Disconnect the power cord from the radio set.
- b. Disconnect the coaxial antenna cable from the radio set.
- c. Remove the antenna from its support, disassemble it, and pack it in the manner received (par. 17).
- d. Roll and pack the antenna cable and power cord.

66. Repacking for Shipment and Limited Storage

a. The exact procedure in repacking for shipment or limited storage depends upon the materials available and the conditions under which the equipment is to be shipped or stored. Refer to paragraph 17 and follow in reverse order the instructions given.

b. Whenever practicable, place a dehydrating agent such as silica gel inside the chests. Protect the cartons with a waterproof paper barrier. Seal the seams of the paper with a waterproof sealing compound or tape. Pack the cartons in the wooden case with sufficient padding or excelsior.

Section II. DEMOLITION OF MATERIEL TO PREVENT ENEMY USE

67. General

The demolition procedure outlined in paragraph 68 will be used to prevent the enemy from using or salvaging this equipment. Demolition of the equipment will be accomplished only upon order of the commander.

68. Methods of Destruction

- a. *Smash.* Smash tubes, coils and capacitors; use sledges, axes, handaxes, pickaxes, hammers, crowbars or heavy tools.
- b. *Cut.* Cut cords and wiring; use axes, handaxes, and machetes.

c. *Burn.* Burn cords, resistors, capacitors, coils, wiring, and technical manuals; use gasoline, kerosene, oil, flame throwers, or incendiary grenades.

d. *Bend.* Bend panels and chassis.

e. *Explosives.* If explosives are necessary, use firearms, grenades, or TNT.

f. *Disposal.* Bury or scatter the destroyed parts in slit trenches, fox holes or other holes, or throw them into streams.

g. *Destroy.* Destroy everything.

APPENDIX I.

REFERENCES

Note. For availability of items listed, check SR 310-20-3, SR 310-20-4, and SR 310-20-5. Check Department of the Army Supply Catalog SIG 1, Introduction and Index, for Signal Corps Supply Catalogs.

1. Army Regulations

AR 380-5
AR 750-5

Military Security (Safeguarding Security Information).
Maintenance of Supplies and Equipment (Maintenance Responsibilities and Shop Operation).

2. Supply Bulletins

SB 11-47

Preparation and Submission of Requisitions for Signal Corps Supplies.

3. Auxiliary Equipment and Test Equipment

TM 11-303	Test Sets I-56-C, I-56-D, I-56-H, and I-56-J.
TM 11-307	Signal Generators I-72-G, H, J, K, and L.
TM 11-321	Technical Manual for Test Set I-56-E.
TM 11-472	Repair and Calibration of Electrical Measuring Instruments.
TM 11-2524	Oscillators I-151-A and I-151-E.
TM 11-2526	Oscilloscope BC-1060-A.
TM 11-2613	Voltohmmeter I-166.
TM 11-2624B	Voltohmmeters, TS-294/U, TS-294B/U, and TS-294C/U.
TM 11-2626	Test Unit I-176, I-176-A, and I-176-B.
TM 11-2627	Tube Tester I-177 and I-177-A.
TM 11-4700	Electrical Indicating and Measuring Instruments, Repair Instructions.
TM 11-5083 (when published)	Tube Tester TV-7/U.
TM 11-5511	Electronic Multimeter TS-505/U.
TM 11-5522	Signal Generator Set AN/URM-27.
TM 11-5527	Multimeter TS-352/U.

4. Painting, Preserving, and Lubrication

TB SIG 13	Moistureproofing and Fungiproofing Signal Corps Equipment.
TB SIG 69	Lubrication of Ground Signal Equipment.
TB SIG 212	Low Temperature Lubricants for Meteorological Equipment.
TM 9-2851	Painting Instructions for Field Use.

5. Camouflage, Decontamination, and Demolition

FM 5-20	Camouflage, Basic Principles.
FM 5-25	Explosives and Demolitions.
TM 3-220	Decontamination.

6. Other Publications

FM 24-18	Field Radio Techniques.
FM 72-20	Jungle Warfare.

6. Other Publications (contd)

SR 310-20-3	Index of Training Publications.
SR 310-20-4	Index of Technical Manuals, Technical Regulations, Technical Bulletins, Supply Bulletins, Lubrication Orders, and Modification Work Orders.
SR 310-20-5	Index of Administrative Publications.
SR 700-45-5	Unsatisfactory Equipment Report (Reports Control Symbol CSGLD-247).
SR 745-45-5	Report of Damaged or Improper Shipment (Reports Control Symbols CSGLD-66 (Army), SandA-70-6 (Navy), and AF-MC-U2 (Air Force)).
Navy Shipping Guide, Article 1850-4	
AFR 71-4	
TM 9-2857	Storage Batteries, Lead-Acid Type.
TM 11-314	Antennas and Antenna Systems.
TM 11-415	Dry Batteries.
TM 11-430	Batteries for Signal Communication. Except those pertaining to Aircraft.
TM 11-455	Radio Fundamentals.
TM 11-466	Radar Electronic Fundamentals.
TM 11-476	Radio Direction Finding.
TM 11-483	Suppression of Radio Noises.
TM 11-486	Electrical Communication Systems Engineering.
TM 11-496	Training Text and Applicatory Exercises for Amplitude-Modulated Radio Sets.
TM 11-499	Radio Propagation Handbook.
TM 11-661	Electrical Fundamentals (Direct Current).
TM 11-681	Electrical Fundamentals (Alternating Current).
TM 11-4000	Trouble Shooting and Repair of Radio Equipment.
TB SIG 4	Methods for Improving the Effectiveness of Jungle Radio Communication.
TB SIG 25	Preventive Maintenance of Power Cords.
TB SIG 54	Working through Jamming with Frequency Modulated Radio Sets.
TB SIG 66	Winter Maintenance of Signal Equipment.
TB SIG 72	Tropical Maintenance of Ground Signal Equipment.
TB SIG 75	Desert Maintenance of Ground Signal Equipment.
TB SIG 123	Preventive Maintenance Practices for Ground Signal Equipment.
TB SIG 178	Preventive Maintenance Guide for Radio Communication Equipment.
TB SIG 219	Operation of Signal Equipment at Low Temperatures.
TB SIG 223	Field Expedients for Wire and Radio.
TB 11-499-() ¹	Basic Radio Propagation Predictions.

¹A new TB in this series is issued monthly; it gives propagation predictions 3 months in advance.

APPENDIX II.

IDENTIFICATION TABLE OF PARTS

1. Requisitioning Parts

The fact that a part is listed in this table is not sufficient basis for requisitioning the item. Requisitions must cite an authorized basis, such as a specific T/O&E, T/A, SIG 7 & 8, list of allowances of expendable material, or another authorized supply basis. The Department of the Army Supply Catalogs applicable to the equipment covered in this manual is SIG 7 & 8-AN/FRR-44. For an index of available supply catalogs, see the latest issue of SIG 1, Introduction and Index.

2. Radio Receiving Set AN/FRR-44

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
W3554	RADIO RECEIVING SET AN/FRR-44: F3 reception; freq data, 25 to 50 mc range, 1 band; oper power requirements, a-c 230 v, 60 cyc, single ph or 115 v, 60 cyc, single ph; cabinet mtd; 21 electron tubes; superheterodyne ckt; 21 $\frac{1}{4}$ " lg x 7 $\frac{1}{2}$ " wd x 10 $\frac{5}{8}$ " h.		2S2001-44
	TECHNICAL MANUAL TM11-225.		Order thru AGO
	ANTENNA AS-612/U: array type; 1 element c/o 20 sect., ea 23 $\frac{5}{8}$ " lg; 25-50 mc freq range; incl 68' 3" cable for connection to radio set.		2A249-612
	ELECTRICAL EQUIPMENT CABINET CY-1150/U: for Radio Sets AN/FRR-36 & 44; incl speaker, vol control, on-off sw and squelch control; MIL spec #N-11539.		6F290-1150
	CABLE, power, electrical: 2 cond, stranded, copper, #16 AWG; ea cond 65 strands 34 AWG; MIL spec #C-3432.	Power cord cable.	1B3016-2.28
	CABLE ASSEMBLY, radio frequency: terminations c/o Plug PL-259-A, Sig C stock #2Z7226-259A; Radio Frequency Plug UG-21B/U, Sig C stock #2Z7390-21B; radio freq cable; Sig C stock #1F425-8A.	Connects antenna to radio set.	3E4001.88
P3559	CABLE ASSEMBLY, power, electrical: 2 cond, stranded, #16 AWG; Buna insulated; 15' lg o/a; c/o cable Sig C stock #1B3016-2.28; term. lugs Sig C stock #3Z12073-36.68; male connector Sig C stock #6Z1727; Motorola part #230B1022.	Power cord cable assembly.	3E4000.140
	CONNECTOR, plug: flat, 2 male, parallel cont; straight type; 1.156" lg excluding cont, 1.531" dia; Hubbell #7057.	Power cord plug.	6Z1727
	POWER SUPPLY PP-846/U: metallic type; output 160 v, .015 amp, 155 v, .005 amp, 145 v, .060 amp, 1.4 v, 1.25 amp, 40 v, .5 ma d-c; 230 v, .200 amp, 115 v, .400 amp, 6.3 v, .45 amp a-c; input 115/230 v, 60 cyc, single ph; MIL spec #N-11539; amendment #2.	Receiver power supply.	3H-14497-846

2. Radio Receiving Set AN/FRR-44 (contd)

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
	RADIO RECEIVER R-257/U: F3 reception; 25 to 50 mc range, 1 band; a-c, 6 v, 60 cyc, single ph; d-c 155 v, .015 amp, 150 v, .060 amp, 24 v, .25 amp, 6 v, .45 amp, 1.4 v, 1.2 amp; mounts in std rack; 14½" lg x 5¾" wd x 8½" h o/a; for mobile comm; MIL spec #N-11539.		2C4180-257
E3561, E3562	TERMINAL LUG: slotted tongue, fl spade type; copper; accom #16 or #14 AWG; 13½" lg x 1½" wd; Aircraft Marine cat #7-33156.	Terminal lugs for power cord.	3Z12073-36.68

3. Antenna AS-612/U

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
	ANTENNA AS-612/U: array type; one element c/o 20 sect., ea 23½" lg; 25-50 mc freq range.	Antenna.	2A249-612
	ANTENNA BASE MP-68: support radiating elements; approx 4" x 4" x 7" o/a; Sig dwgs #SC-D-17306, 17307 and 17308.	Antenna base.	2A282A-68
	BARE UNIT FOR ANTENNA AS-612/U.		2A249-612Z
	CORD CG-399A/U: (68' 3") JAN type #RG-8A/U; single cond, 7 strands #21 AWG; 68' lg excluding termination.	Connects antenna to radio set.	3E4001.54
	MAST SECTION AB-21/GR: ant; 23½" lg x .393" dia o/a; Sig dwg #SC-D-13614.	Part of antenna.	2A2450-21
	MAST SECTION AB-22/GR: ant; 23½" lg, tapers from 1½" to 1½" OD; Sig dwg #SC-D-13614.	Part of antenna.	2A2450-22
	MAST SECTION AB-23/GR: ant; 23½" lg x 1½" dia x .012" wall thk; Sig dwg #SC-D-13614.	Part of antenna.	2A2450-23
	MAST SECTION AB-24/GR: ant; 23½" lg x 1½" dia x .012" wall thk; Sig dwg #SC-D-13614.	Part of antenna.	2A2450-24
	MAST SECTION AB-35/TRC-7: ant; 33" lg x 1½" dia x .065" thk; Sig dwg #SC-D-16842.	Part of antenna.	2A2450-35
	MOUNTING, BRACKET: ant mtg; eight ½" dia mtg holes, 4 on 3" x 4" mtg/c; and 4 on 3" x 5½" mtg/c; Motorola part #207K1330.	Mounts antenna.	2Z6820.620
	PLUG PL-259-A: 1 round, male cont; straight type; 12½" lg x 1½" dia 1 end, ½" dia other end; Navy dwg #RE49F167 type #49195.	Terminates antenna cable.	2Z7226-259A
	RADIO FREQUENCY CABLE RG-8A/U: coax; 52 ohm impedance, 68' w/AS-612/U, p/o Cord CG-399A/U; 29.5 uuf/ft; JAN-C-17.	Connects antenna to radio set.	1F425-8A

3. Antenna AS-612/U (contd)

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
	RADIO FREQUENCY PLUG UG-21B/U: 1 round, male cont; straight type; 2" lg x $\frac{3}{4}$ " dia o/a; Navy dwg #RE49F402. ROLL CW-50/TRC-7.	Terminates antenna cable.	2Z7390-21B

4. Electrical Equipment Cabinet CY-1150/U

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
	ELECTRICAL EQUIPMENT CABINET CY-1150/U: contains power, vol, and squelch controls, and loudspeaker for Radio Receiving Sets AN/FRR-36 and -44; 21 $\frac{1}{4}$ " lg x 7 $\frac{1}{2}$ " wd x 10 $\frac{5}{8}$ " h o/a; MIL spec #N-11539; c/o following parts.	Housing and control unit for radio set.	6F290-1150
H2411, H2412	BUSHING: steel; .5" lg x .75" OD x .196" ID; Motorola part #243B1045.	Bushing for mounting handle.	Order thru AGO
H2437, H2442	CLIP, electrical: spring bronze; $\frac{1}{16}$ " lg x $1\frac{1}{32}$ " wd x $\frac{5}{16}$ " h; Bussman Mfg. Co. part #4548.	Fuse clips.	
H2416	CAP MX-913/U: round; $\frac{3}{4}$ " dia x $\frac{7}{16}$ " thk o/a, excluding chain; Industrial Products part #5650.	Receptacle connector protective cap.	2Z1619-115
H2401	CLAMP, electrical: $1\frac{1}{16}$ " lg x $\frac{1}{2}$ " wd x $\frac{5}{16}$ " h; holds matl up to $\frac{1}{4}$ " max dia cable; Commercial Plastics part #CPC-1949-4.	Cable clamp.	8P1-100-1
H2402, H2403	CLAMP, electrical: $1\frac{1}{8}$ " lg x $\frac{1}{2}$ " wd x $\frac{7}{16}$ " h; hold matl $\frac{5}{16}$ " max dia cable; Commercial Plastics catalogue #CPC-1949-5.	Cable clamps.	8P1-101-3
H2438 thru H2441	COLLAR, spacing: brass; .159" lg x .375" dia o/a; Motorola part #243B1070.	Spacing collar for mounting of receptacle J2401.	
H2406 thru H2409	COLLAR, spacing: aluminum alloy; cylindrical shape; $\frac{7}{32}$ " lg x $\frac{3}{8}$ " dia o/a; Motorola part #243B1047.	Spacer for speaker grill.	
P2401	CONNECTOR, PLUG UG-536/U; 1, male round, straight type; $1\frac{3}{4}$ " lg x $1\frac{1}{16}$ " dia.	Receiver input cable connector.	2Z7390-536
J2402	CONNECTOR, receptacle: 2, female round pol; straight type; $1\frac{5}{8}$ " lg x $1\frac{1}{16}$ " dia; Motorola part #209A1048.	Input receptacle for receiver antenna.	2Z3056-22
J2401	CONNECTOR, receptacle: 31, male round pol; straight type; $3\frac{3}{8}$ " lg x $1\frac{1}{8}$ " wd x $1\frac{11}{16}$ " h; Cannon Electric part #DPD-A31C1-33S-2L.	Connects receiver unit to case.	2Z3046.38
A2401	COVER, cabinet: aluminum alloy; $10\frac{1}{16}$ " lg x $6\frac{9}{16}$ " wd x $\frac{7}{8}$ " h o/a; Motorola part #215K1179.	Rear cover for cabinet.	
A2402	COVER, cabinet: aluminum alloy; $10\frac{1}{16}$ " lg x $6\frac{5}{8}$ " wd x $\frac{7}{8}$ " h o/a; Motorola part #215C1162.	Front cover for cabinet.	

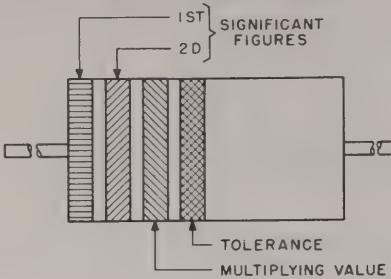
4. Electrical Equipment Cabinet CY-1150/U (contd)

Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
A2403	COVER, cable: $4\frac{1}{4}$ " lg x $1\frac{3}{8}$ " wd x $\frac{3}{4}$ " h; for cable entrance in cabinet; Motorola part #215C1155.	Cable entrance cover.	2Z3351-537
H2417 thru H2424	FASTENER, latch: cabinet latch for case cover; $2\frac{1}{8}$ " lg x $1\frac{3}{8}$ " wd x $\frac{1}{16}$ " d o/a; American Hardware part #15824.	Cabinet latches for case cover, front.	6Z6918-8
U2415	GASKET: for cable cover; rectangular shape; 3" lg x 1" wd x $\frac{3}{16}$ " thk o/a; Motorola part #232B1017.	Cable cover gasket.	2Z4866.580
U2401	GASKET: for speaker; neoprene; 5 holes; sq, $3\frac{7}{8}$ " lg x $3\frac{7}{8}$ " wd x $\frac{1}{16}$ " thk o/a; Motorola part #232B1102.	Speaker gasket.	2Z4866.571
U2402, U2403	GASKET: rectangular shape; $10\frac{1}{16}$ " lg x $6\frac{3}{16}$ " wd x $\frac{1}{4}$ " thk o/a; Motorola part #232C1115.	Gasket seal for front and rear covers.	2Z4866.577
H2405	GRILLE: steel; square shape; $4\frac{1}{16}$ " lg x $4\frac{1}{16}$ " wd o/a; Motorola part #213B1001.	Loudspeaker grill.	
H2410	HANDLE: for case cover; $5\frac{1}{32}$ " lg x $1\frac{3}{4}$ " d x $\frac{1}{4}$ " dia o/a; Motorola part #255B1024.	Case cover handle.	6Z5010-30
H2413, H2414	KNOB: round w/bar; green; marked with 3 straight lines, 2 on top and 1 on end of bar; $1\frac{1}{16}$ " dia x $\frac{7}{8}$ " h; Motorola part #236C1001.	Volume and squelch control knobs.	2Z5822-808
	LAMP LM-52: 6-8 v, 1.2 w, .15 amp; miniature bayonet base; Mazda #47.	Pilot light.	2Z5952
I 2402	LENS, indicator light: green, $\frac{1}{2}$ " dia; $\frac{1}{16}$ " lg x $\frac{5}{8}$ " dia o/a; dial light part #81-122.	Cap for indicator light I 2401.	2Z6125-217
I 2401	LIGHT, indicator: w/lens; $2\frac{1}{4}$ " lg x $1\frac{3}{16}$ " dia; dial light part #81410-122.	Dial light assembly.	2Z5991-333
LS2401	LOUDSPEAKER, dynamic: PM field; 3 w normal input; diaphragm type; 4" sq x $2\frac{1}{16}$ " d; University Loudspeakers model #C4BR; ea.	Loudspeaker.	6C48-59
H2427	PLATE, lock: steel; rectangular shape; 2" lg x $1\frac{5}{16}$ " wd x $\frac{1}{8}$ " thk o/a; Alden Products part #11019-5-3.	Lock-in plate for receiver mounting.	
R2401, R2404	RESISTOR, fixed, comp: 10 ohms $\pm 10\%$; $\frac{1}{2}$ w; JAN type #RC20BF100K.	Attenuates audio frequency outputs.	3RC20BF100K
R2406, R2407	RESISTOR, fixed, comp: 10 ohms $\pm 10\%$; 1 w; JAN type RC30BF100K.	Attenuates audio frequency outputs.	3RC30BF100K
R2402	RESISTOR, fixed, comp: 15 ohms $\pm 10\%$; $\frac{1}{2}$ w; JAN type #RC20BF150K.	Attenuates audio frequency outputs.	3RC20BF150K
R2403	RESISTOR, fixed, comp: 33 ohms $\pm 10\%$; $\frac{1}{2}$ w; JAN type #RC20BF330K.	Attenuates audio frequency outputs.	3RC20BF330K
R2405	RESISTOR, fixed, comp: 68 ohms $\pm 10\%$; $\frac{1}{2}$ w; JAN type #RC20BF680K.	Attenuates audio frequency outputs.	3RC20BF680K

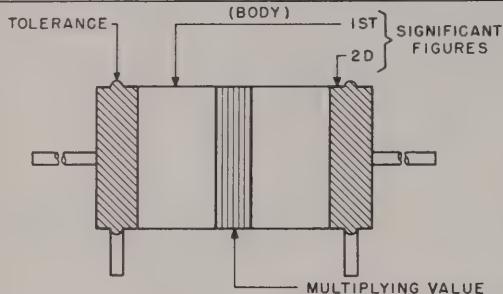
Ref symbol	Name of part and description	Function of part	Signal Corps stock No.
R2408	RESISTOR, variable: comp; 500,000 ohms $\pm 10\%$; $\frac{1}{4}$ w; w/SPST sw; $1\frac{5}{16}$ " dia x $1\frac{3}{32}$ " d o/a; Motorola part #218B1003.	Manual squelch control.	3Z7498-50.211
H2425, H2426	SPRING, helical extension: shock absorber spring for chassis; 5.437" lg x .382" dia o/a; 78 turns; Motorola part #241B1015.	Shock absorbers for plug-in chassis.	2Z8878-107
H2429 thru H2436	STRIKE, fastener: for draw pull catch; rectangular shape; $\frac{9}{16}$ " lg x $\frac{7}{8}$ " wd x $\frac{1}{4}$ " h o/a; American Hardware type #15794.	Fasteners for draw pull catch, rear cover.	6Z3810-27.1
S2401	SWITCH, rotary: volume control and a-c switch; 2 poles, 5 throws; $1\frac{11}{32}$ " lg x $1\frac{1}{4}$ " dia; Oak part #48954-FIAC.	Stepped volume control and a-c switch.	3Z9825-23.13
TB2401	TERMINAL BOARD: 8 term. double screw type; $4\frac{1}{4}$ " lg x $1\frac{11}{32}$ " wd x $\frac{1}{2}$ " h; Motorola part #231K1046. TOOL, alignment: nylon body; 6" lg x $\frac{1}{4}$ " dia; Motorola part #266B1001. BARE UNIT: for Electrical Equipment Cabinet CY-1150/U.	Terminal board. Alignment tool.	3Z770-8.133 6F290-1150Z

RESISTOR COLOR AND LETTER CODE

RMA COLOR CODE FOR FIXED COMPOSITION RESISTORS

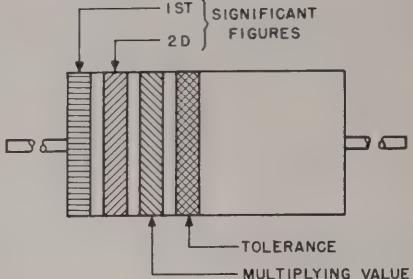


METHOD A

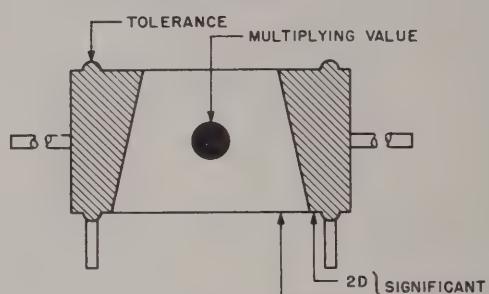


METHOD B

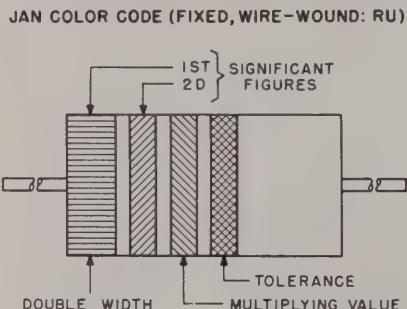
JAN COLOR CODE FOR FIXED COMPOSITION RESISTORS



METHOD A



METHOD B



STANDARDS

COLOR	SIGNIFICANT FIGURE	MULTIPLYING VALUE	TOLERANCE (%)	JAN LETTER TOLERANCE
BLACK	0	1	—	—
BROWN	1	10	± 1	F
RED	2	100	± 2	G
ORANGE	3	1,000	± 3	—
YELLOW	4	10,000	± 4	—
GREEN	5	100,000	± 5	—
BLUE	6	1,000,000	± 6	—
VIOLET	7	10,000,000	± 7	—
GRAY	8	100,000,000	± 8	—
WHITE	9	1,000,000,000	± 9	—
GOLD	—	0.1	± 5	J
SILVER	—	0.01	± 10	K
NO COLOR	—	—	± 20	M

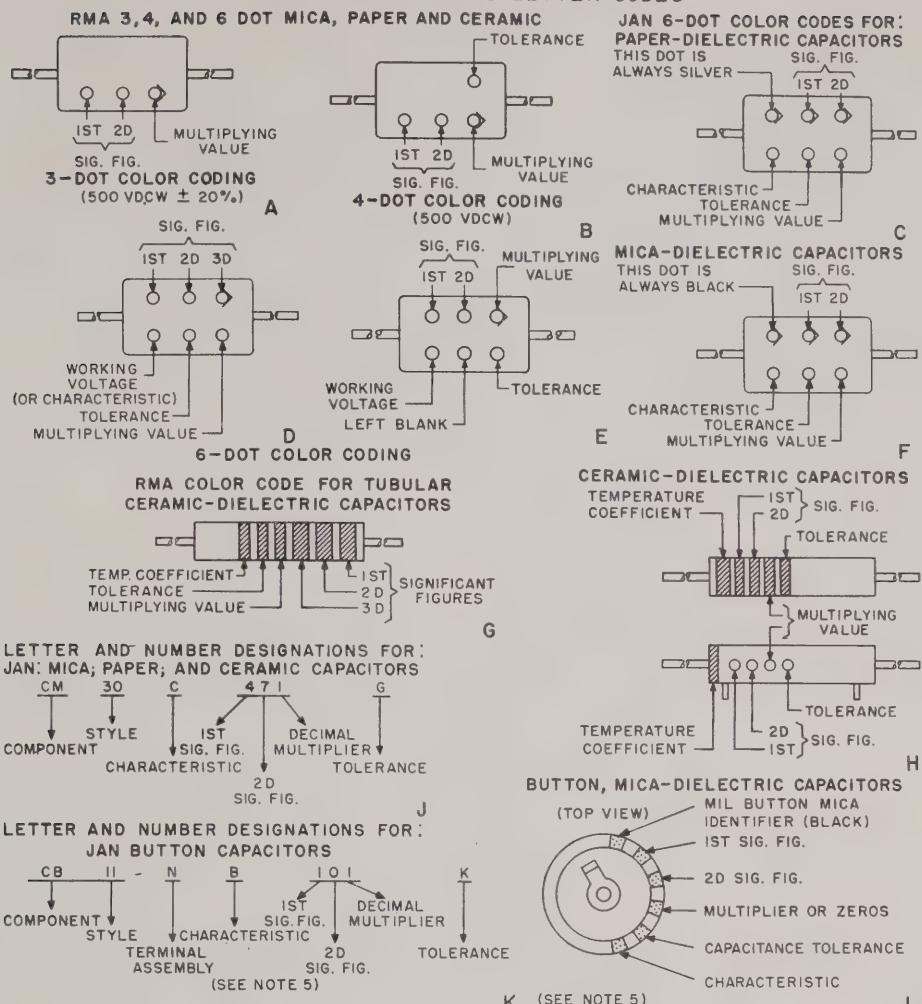
NOTES:

1. RESISTORS WITH AXIAL LEADS ARE INSULATED. RESISTORS WITH RADIAL LEADS ARE NON-INSULATED.
2. RMA: RADIO MANUFACTURERS ASSOCIATION.
3. JAN: JOINT ARMY - NAVY.
4. THESE COLOR AND NUMBER CODES GIVE ALL RESISTANCE VALUES IN OHMS.
5. RESISTIVE COMPONENTS USED FOR LETTER TOLERANCES ARE: RC, RN, AND RU.
6. WATTAGE FOR RW TYPES IS FOUND IN THE JAN SPECIFICATIONS UNDER CHARACTERISTICS.

TM RC

Figure 27. Resistor color codes.

CAPACITOR COLOR AND LETTER CODES



- STANDARDS -				JAN MICA-CH		JAN PAPER-CH		JAN CERAMIC-CC					
COLOR	SIG. FIG.	DECIMAL MULTIPLIER	TOL.	VDCW	LETTER TOL.	CHARAC-TERISTIC	LETTER TOL.	CHARAC-TERISTIC	DEC. MULT.	%	LETTER DESIG-NATION	CAP.TOL.FOR MORE THAN 10 UUF	CAP.TOL.FOR 10 UUF OR LESS
BLACK	0	1	± 20	500	M	A	M	A	1	± 20	M	± 2.0	G
BROWN	1	10	± 1	100	-	B	-	E	10	± 1	F	-	-
RED	2	100	± 2	200	G	C	-	H	100	± 2	G	-	-
ORANGE	3	1,000	± 3	300	-	D	N*	J	1,000	-	-	-	P
YELLOW	4	10,000	± 4	400	-	E	-	P	-	-	-	-	R
GREEN	5	100,000	± 5	500	-	F	-	R	-	± 5	J	± 0.5	D
BLUE	6	1,000,000	± 6	600	-	G	-	S	-	-	-	-	T
VIOLET	7	10,000,000	± 7	700	-	-	-	T	-	-	-	-	U
GRAY	8	100,000,000	± 8	800	-	-	-	-	0.01	-	-	± 0.25	C
WHITE	9	1,000,000,000	± 9	900	-	-	-	-	0.1	± 10	K	± 1.0	F
GOLD	-	-	± 5	1,000	J	-	-	-	-	-	-	-	A
SILVER	-	-	± 10	2,000	K	-	-	-	-	-	-	-	-
NO COLOR	-	-	± 20	500	-	-	-	-	-	-	-	-	-

* THE TOLERANCE OF THIS CAPACITOR IS $\pm 30\%$, NOT $\pm 3\%$

NOTES

JAN: JOINT ARMY-NAVY
 RMA: RADIO MANUFACTURERS ASSOCIATION

- THESE COLOR AND LETTER CODES GIVE CAPACITANCES IN MICROMICROFARADS
- THIS TABLE IS ADAPTED FOR JAN AND RMA COLOR AND JAN LETTER TYPE DESIGNATIONS
- CERAMIC AND MICA CAPACITORS, BOTH JAN AND RMA, ARE GENERALLY 500 VDCW
- BUTTON CAPACITORS ARE GENERALLY 300 VDCW
- READ BUTTON CAPACITOR TOLERANCE UNDER CERAMICS OF MORE THAN 10 UUF
- CHARACTERISTICS ARE AVAILABLE IN JAN CAPACITOR SPECIFICATION MANUALS
- THE COMPONENTS USED ABOVE FOR JAN LETTER TYPE DESIGNATIONS ARE:
 CP MICA BUTTON; CC CERAMIC; CW MICA MOULDED; CN PAPER MOULDED

TM CC

Figure 28. Capacitor color codes.

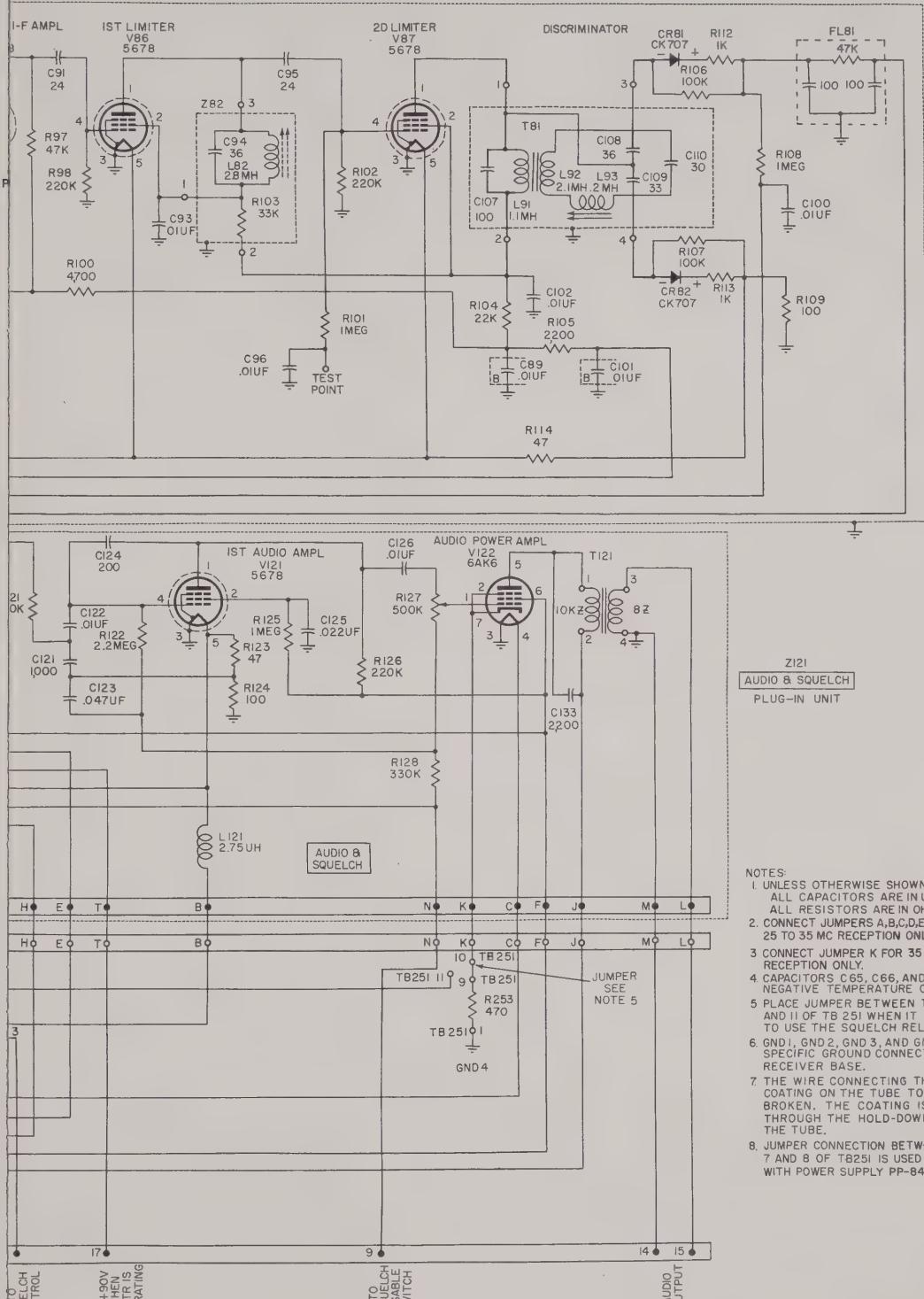


Figure 29. Radio Receiver R-257/U, schematic diagram.

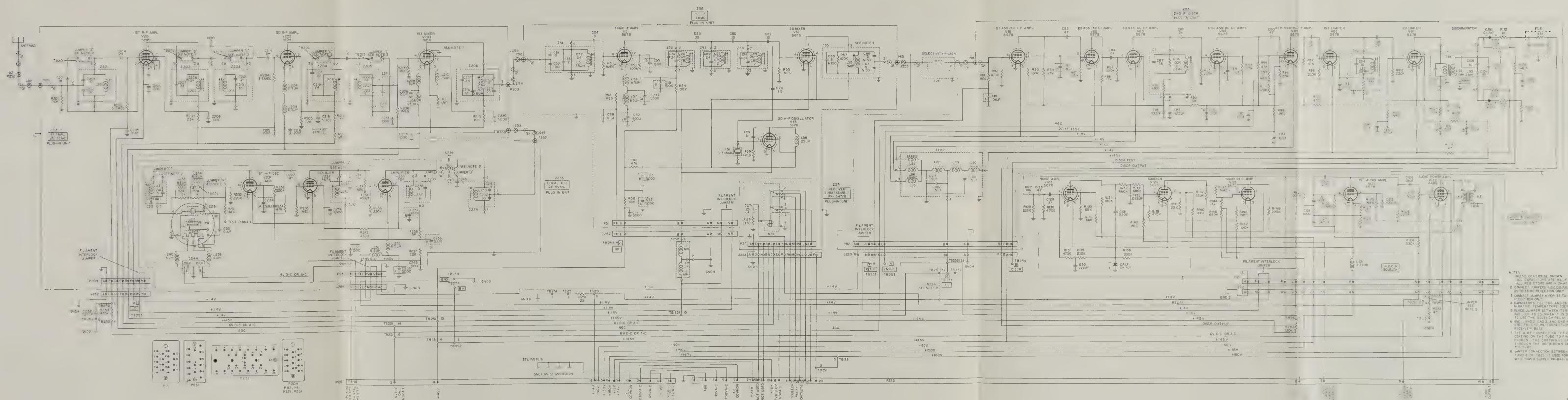


Figure 29. Radio Receiver R-257 U, schematic diagram.

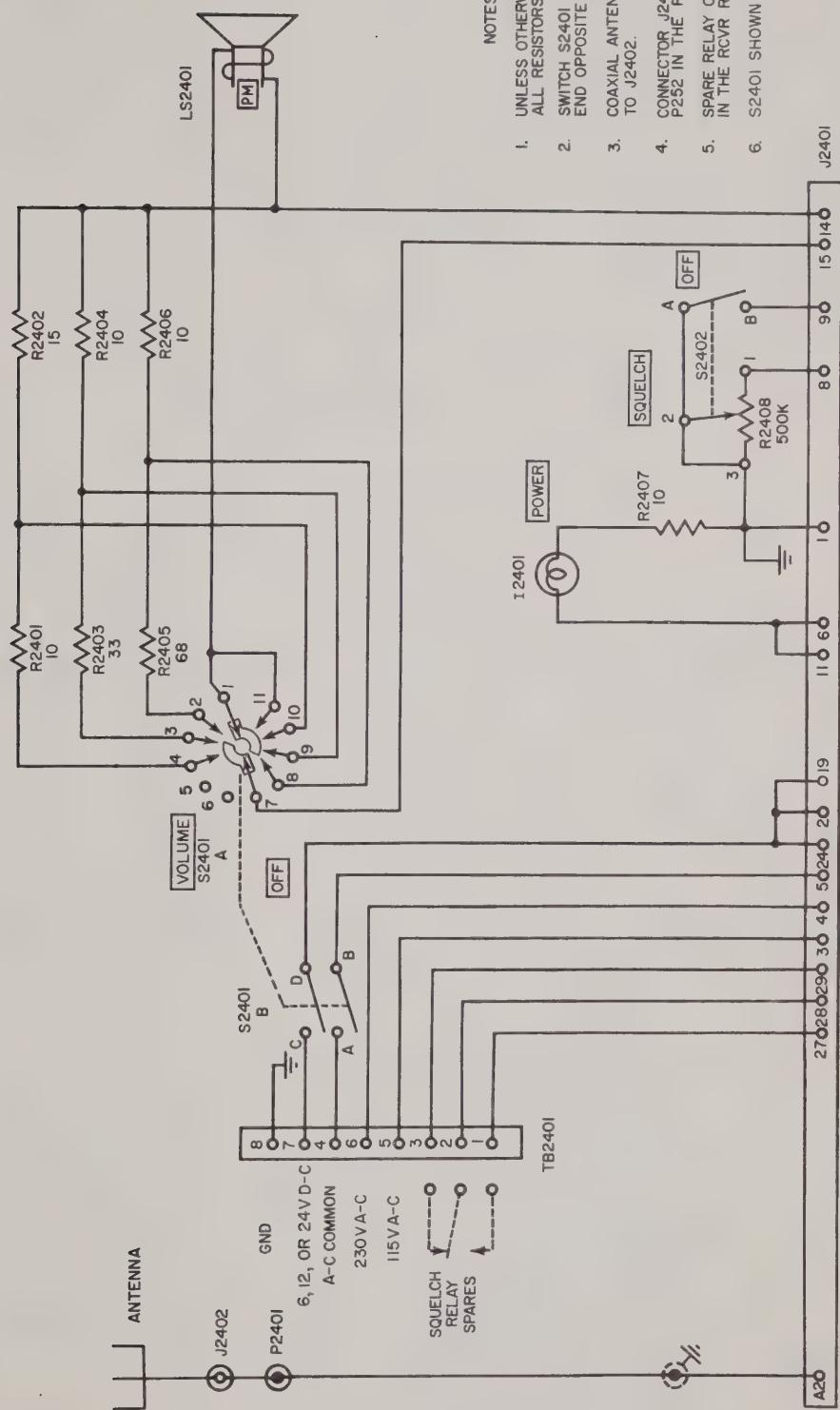


Figure 30. Electrical Equipment Cabinet CY-1150/U, schematic diagram.

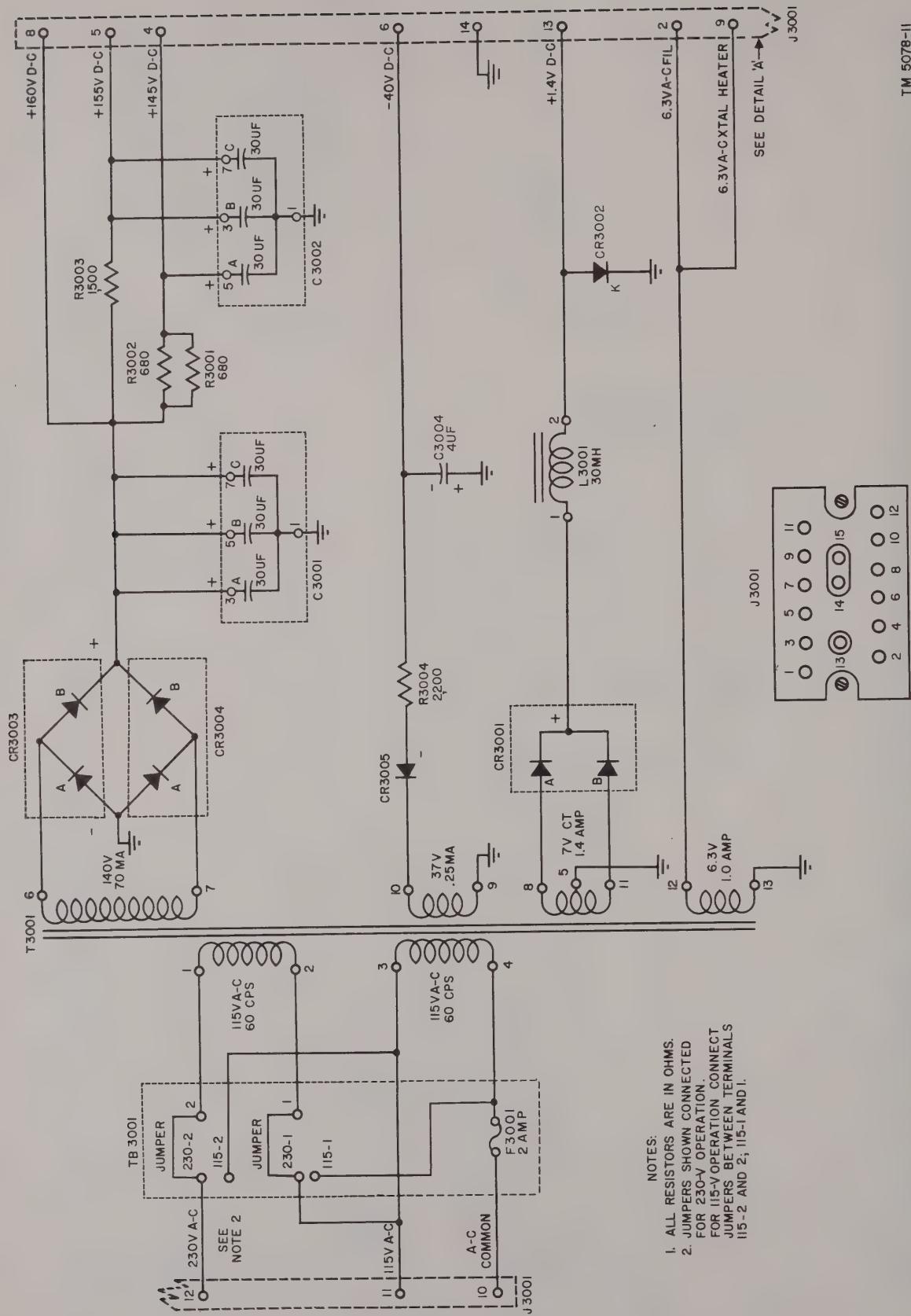
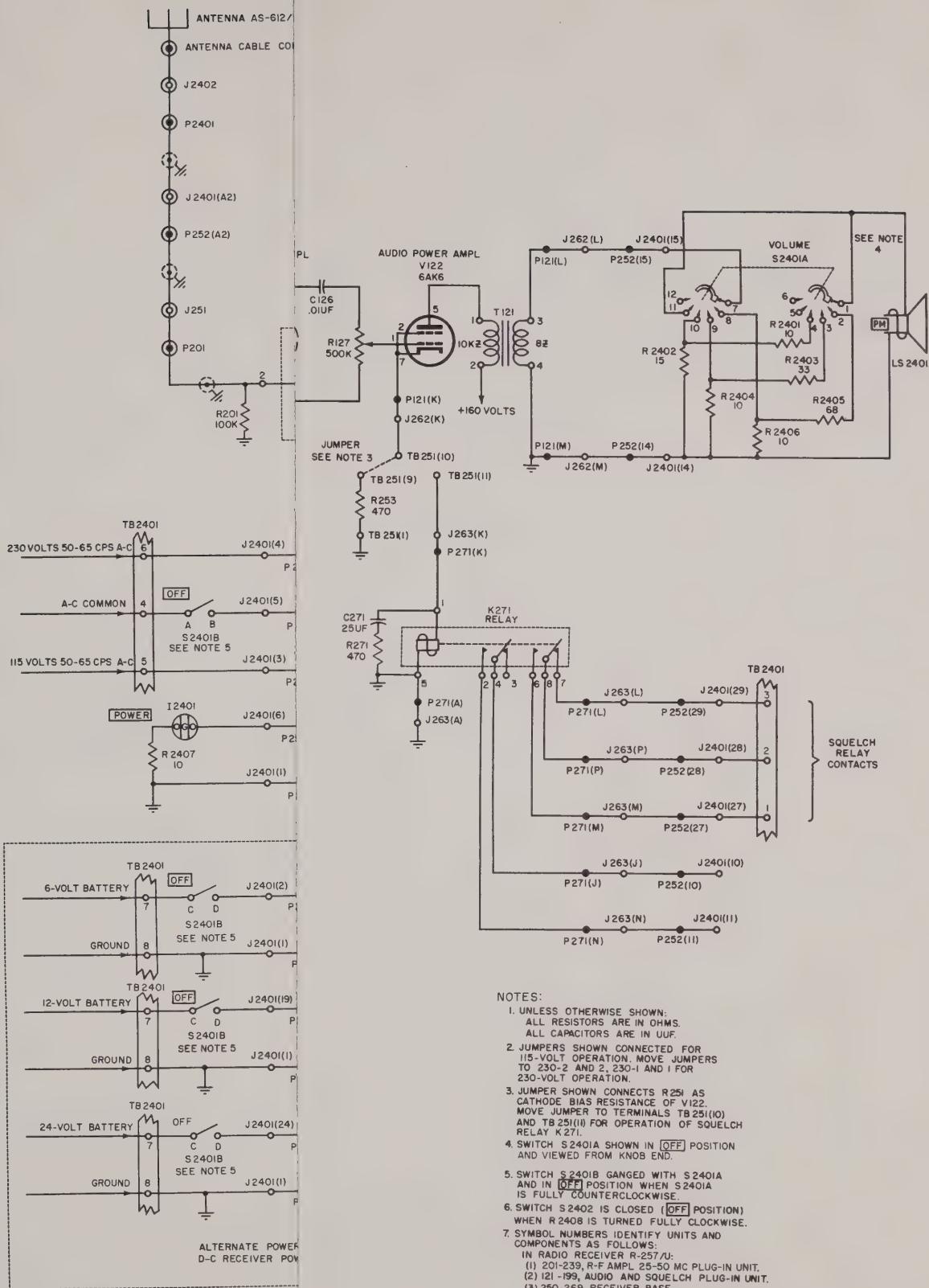


Figure 31. Power Supply PP-846/U: schematic diagram.



NOTES:

1. UNLESS OTHERWISE SHOWN, ALL RESISTORS ARE IN OHMS. ALL CAPACITORS ARE IN UF.
2. JUMPERS SHOWN CONNECTED FOR 115-VOLT OPERATION. MOVE JUMPERS TO 230-2 AND 2, 230-1 AND 1 FOR 230-VOLT OPERATION.
3. JUMPER SHOWN CONNECTS R251 AS CATHODE BIAS RESISTANCE OF V122. MOVE JUMPER TO TERMINALS TB251(10) AND TB251(11) FOR OPERATION OF SQUELCH RELAY K271.
4. SWITCH S2401A SHOWN IN [OFF] POSITION AND VIEWED FROM KNOB END.
5. SWITCH S2401B GANGED WITH S2401A AND IN [OFF] POSITION WHEN S2401A IS FULLY COUNTERCLOCKWISE.
6. SWITCH S2402 IS CLOSED ([OFF] POSITION) WHEN R2408 IS TURNED FULLY CLOCKWISE.
7. SYMBOL NUMBERS IDENTIFY UNITS AND COMPONENTS AS FOLLOWS:
 - (1) 201-239, R-F AMPL 25-50 MC PLUG-IN UNIT.
 - (2) 121-199, AUDIO AND SQUELCH PLUG-IN UNIT.
 - (3) 250-269, RECEIVER BASE.
 - (4) 271-299, RELAY PLUG-IN UNIT.
 - (5) 2401-2499, ELECTRICAL EQUIPMENT CABINET CY-1150/U.
 - (6) 2701-2799, POWER SUPPLY PP-869/U
 - (7) 2801-2899, POWER SUPPLY PP-868/U
 - (8) 2901-2999, POWER SUPPLY PP-867/U
 - (9) 3001-3099, POWER SUPPLY PP-846/U

TM 225-32

Figure 32. Radio Receiving Set AN/FRR-44, control circuits.

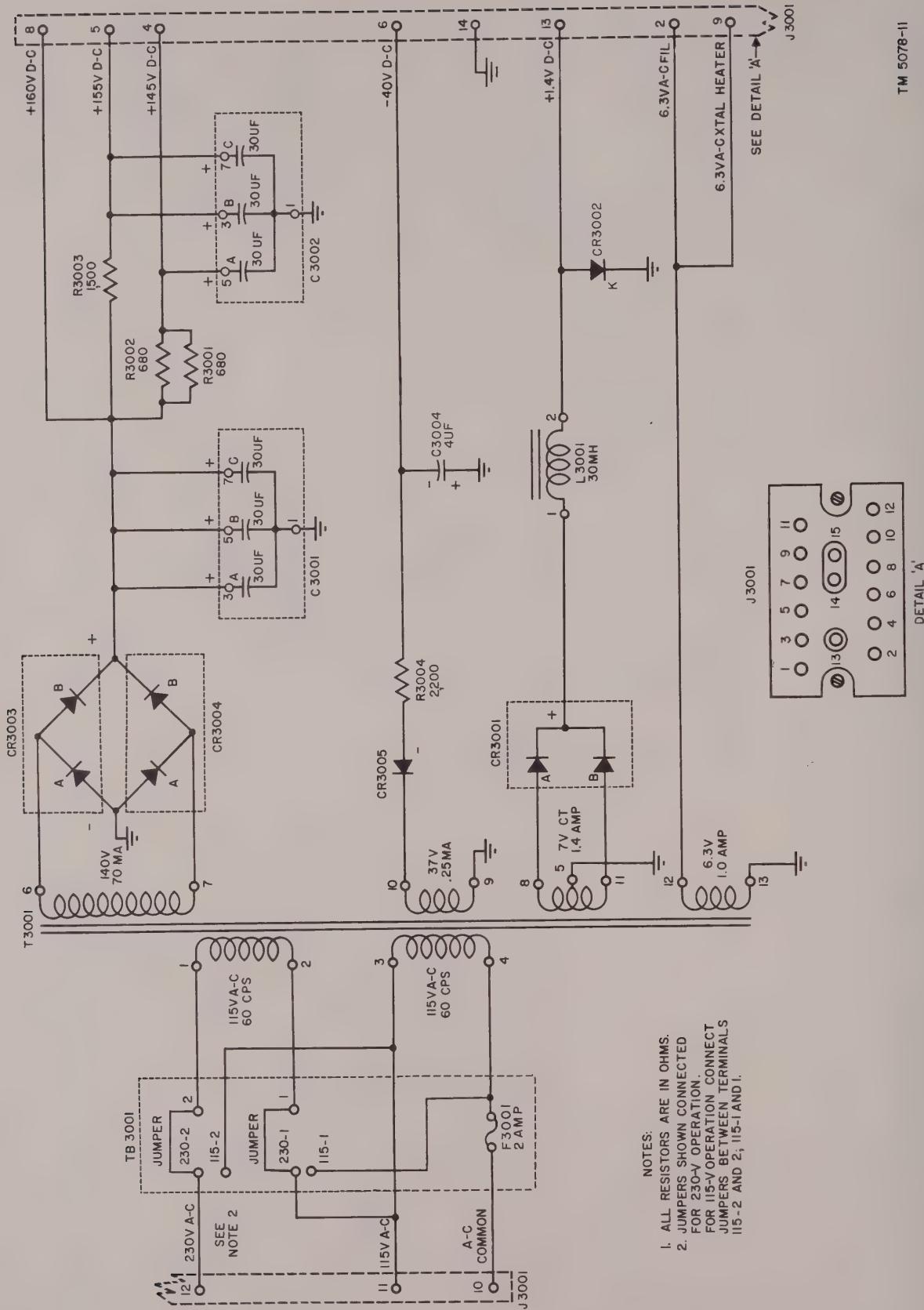


Figure 31. Power Supply PP-846/U, schematic diagram.

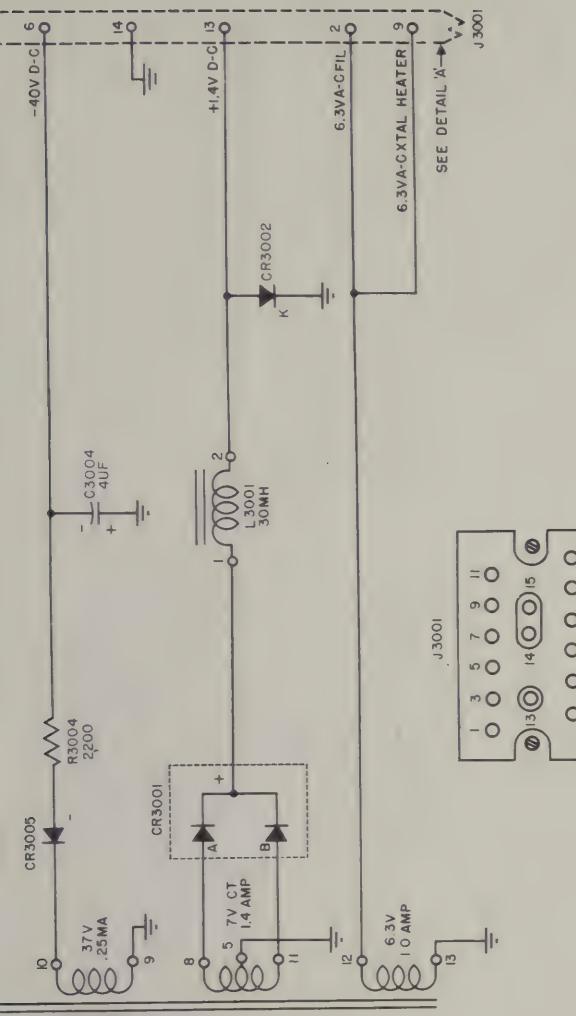


Figure 31. Power Supply PP-846/U, schematic diagram.

SEE DETAIL 'A'
J 3001

TM 5078-II

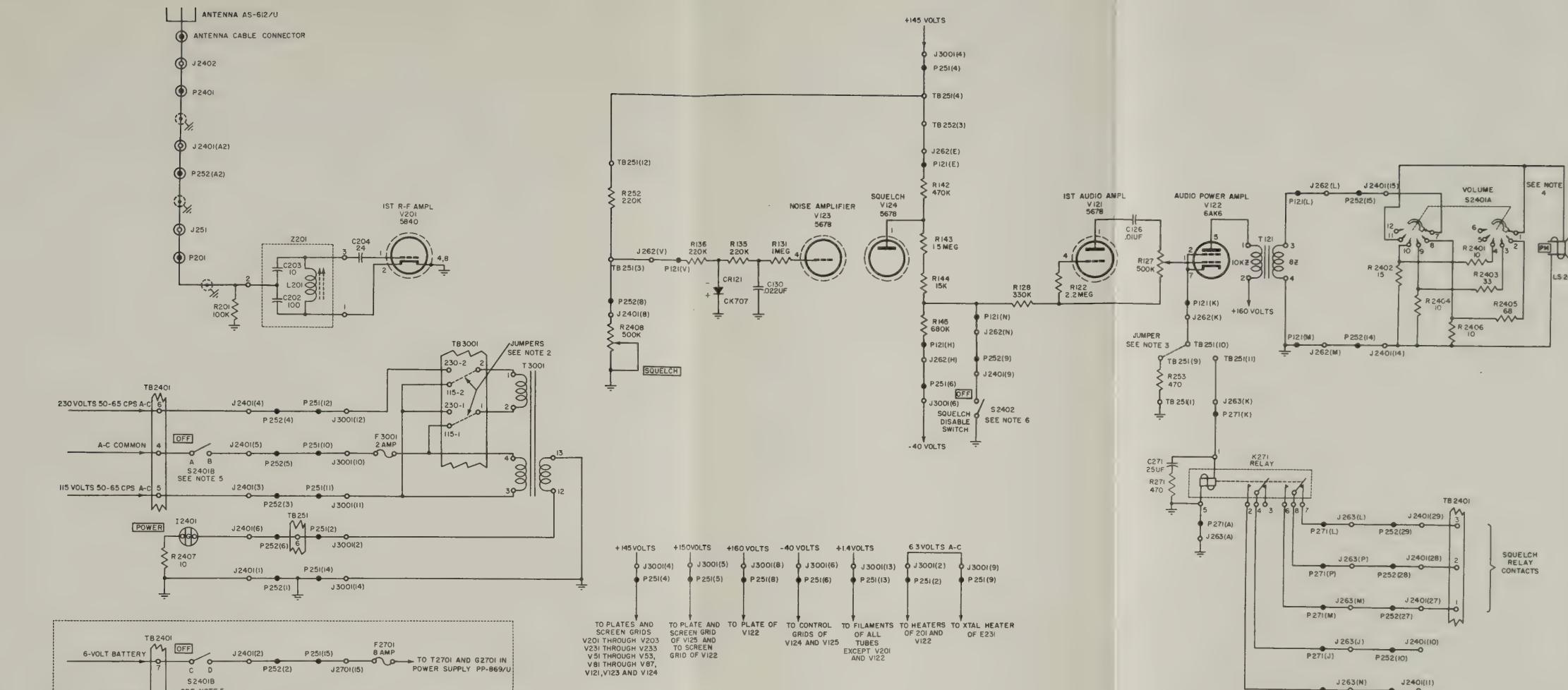
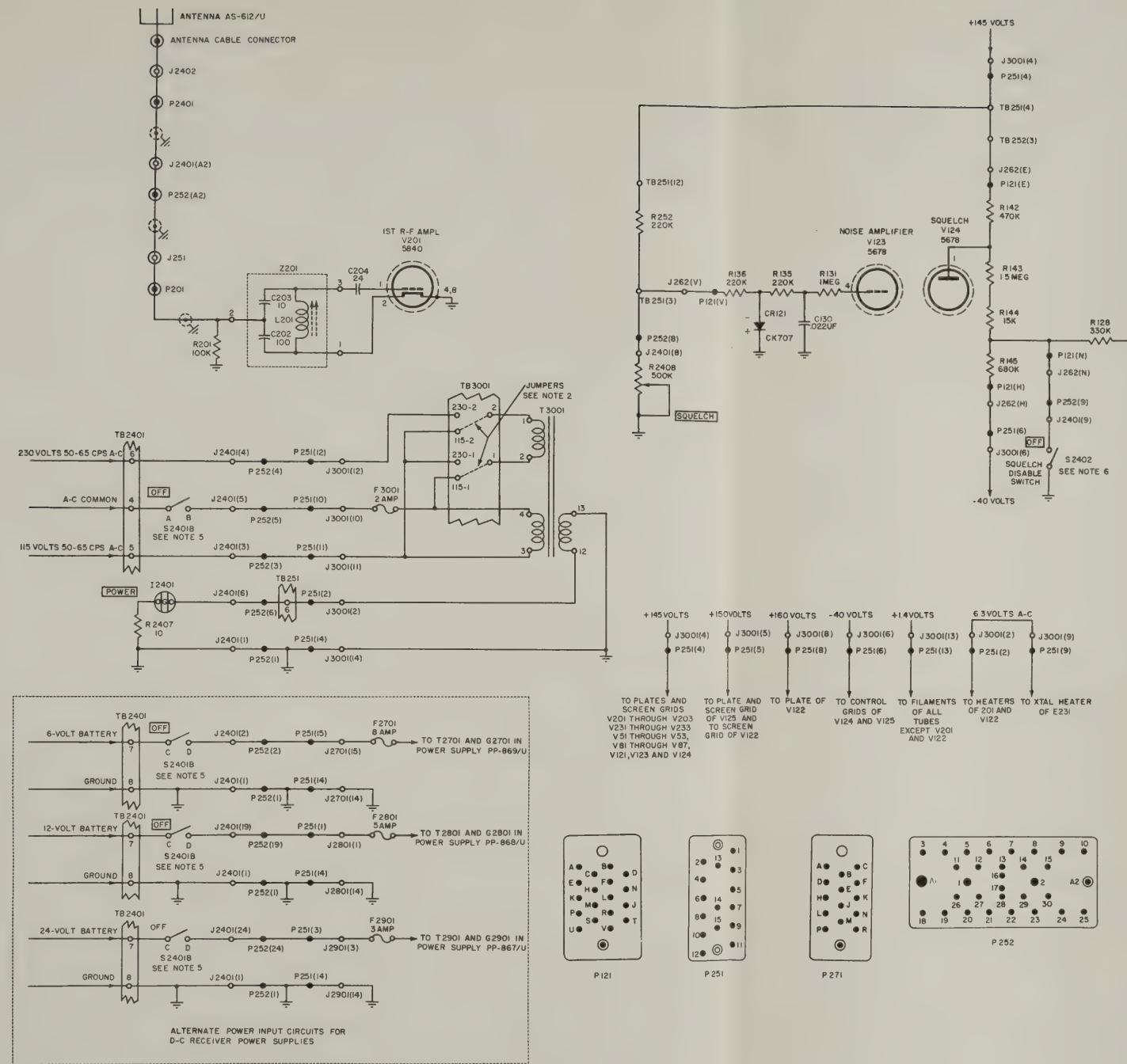


Figure 32. Radio Receiving Set AN/FRR-44, control circuits.

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